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

# Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion

## Skagway Ore Terminal Redevelopment Project

**NMFS Consultation Number:** AKRO-2022-02952

**Action Agencies:** National Marine Fisheries Service (NMFS), Office of Protected Resources, Permits and Conservation Division; U.S. Army Corps of Engineers (USACE)

**Affected Species and Determinations:**

| ESA-Listed Species | Status | Is the Action Likely to Adversely Affect Species? | Is the Action Likely to Adversely Affect Critical Habitat? | Is the Action Likely To Jeopardize the Species? | Is the Action Likely To Destroy or Adversely Modify Critical Habitat? |
|---|---|---|---|---|---|
| Steller Sea Lion, Western DPS (*Eumetopias jubatus)* | Endangered | Yes | No | No | No |
| Humpback Whale, Mexico DPS (*Megaptera novaeangliae*) | Threatened | Yes | No | No | No |
| Blue whale (*Balaenoptera musculus*) | Endangered | No | N/A | No | N/A |
| Fin Whale (*Balaenoptera physalus*) | Endangered | No | N/A | No | N/A |
| Sei Whale (*Balaenoptera borealis*) | Endangered | No | N/A | No | N/A |
| Humpback Whale, Western North Pacific DPS (*Megaptera novaeangliae*) | Endangered | No | No | No | No |
| North Pacific Right Whale (Eubalaena *japonica*) | Endangered | No | No | No | No |
| Sperm Whale (*Physeter macrocephalus*) | Endangered | No | N/A | No | N/A |

| | | | | | |
|---|---|---|---|---|---|
| Killer Whale, Southern Resident DPS *(Orcinus orca)* | Endangered | No | No | No | No |
| Cook Inlet Beluga Whale (*Delphinapterus leucas)* | Endangered | No | No | No | No |
| Sunflower Sea Star (*Pycnopodia helianthoides*) | Proposed | No | NA | No | N/A |

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

**Issued By**:_____
Jonathan M. Kurland
Regional Administrator

**Date**: August 23, 2023

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## TERMS AND ABBREVIATIONS

| | |
|---|---|
| µPa | Micro Pascal |
| ADEC | Alaska Department of Environmental Conservation |
| ADFG | Alaska Department of Fish and Game |
| AKR | Alaska Region |
| BA | Biological Assessment |
| dB re 1µPa | Decibel referenced 1 microPascal |
| District Court | U.S. District Court for the District of Alaska |
| DPS | Distinct Population Segment |
| ESA | Endangered Species Act |
| ESCA | Endangered Species Conservation Act |
| EPA | Environmental Protection Agency |
| ERT | Early Review Team |
| ESA | Endangered Species Act |
| °F | Fahrenheit |
| FR | Federal Register |
| FRN | Federal Register Notice |
| ft | Feet |
| GOA | Gulf of Alaska |
| HF | High frequency |
| Hz | Hertz |
| IHA | Incidental Harassment Authorization |
| IPCC | Intergovernmental Panel on Climate Change |
| ITA | Incidental Take Authorization |
| ITS | Incidental Take Statement |
| kHz | Kilohertz |
| km | Kilometers |
| kt | Knots |
| LF | Low frequency |
| m | Meter |
| MF | Mid frequency |
| MHHW | Mean higher high water |
| mi | Mile |
| MLLW | Mean lower low water |
| MMPA | Marine Mammal Protection Act |
| MOS | Municipality of Skagway |

| | |
|---|---|
| nm | Nautical mile |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NPDES | National Pollution Discharge Elimination System |
| NRC | National Research Council |
| Opinion | Biological Opinion |
| OW | Otariid water |
| Pa | Pascals |
| PBF | Physical or biological features |
| PCE | Primary constituent element |
| PK | Peak sound level |
| ppm | Parts per million |
| PSO | Protected Species Observer |
| PTS | Permanent Threshold Shift |
| PW | Phocid water |
| RMS | Root Mean Square |
| RORO | Roll-on roll-off ramp |
| RPA | Reasonable and Prudent Alternative |
| RPM | Reasonable and prudent measure |
| s | Second |
| SEL | Sound Exposure Level |
| SELcum | Cumulative sound exposure levels |
| $SPL_{PK}$ | Peak sound pressure level |
| TL | Transmission loss |
| TTS | Temporary Threshold Shift |
| UME | Unusual Mortality Event |
| USACE | U.S. Army Corps of Engineers |
| USFWS | United States Fish and Wildlife Services |
| VGP | Vessel General Permit |
| WNP | Western North Pacific |
| Yds | Yards |

# 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 action agencies are the NMFS Office of Protected Resources, Permits and Conservation Division (hereafter referred to as "Permits Division") and U.S. Army Corps of Engineers (hereafter referred to as USACE). The NMFS Permits Division plans to issue an incidental harassment authorization (IHA) pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. § 1361 et seq.), to the Municipality of Skagway (MOS) for harassment of marine mammals incidental to the proposed Skagway Ore Terminal redevelopment project. The USACE plans to issue a permit for the proposed action (POA-2022-00341). The consulting agency for this proposal is NMFS's Alaska Region. This document represents NMFS's biological opinion (opinion) on the effects of this proposal on endangered and threatened species and designated critical habitat.

The opinion and ITS were prepared by NMFS Alaska Region in accordance with section 7(b) of the ESA (16 U.S.C. § 1536(b)), 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 is based on information provided in the IHA application, the proposed IHA (88 FR 23627, April 18, 2023), and the Biological Assessment with addendums. Other sources of information include consultation communications (emails and virtual meetings), recent consultations completed in the region, and previous monitoring reports. A complete record of this consultation is on file at NMFS's Anchorage, Alaska office.

The proposed action involves the redevelopment of the Skagway Ore Terminal (Figure 1). Existing in-water and overwater structures will be replaced in order to better meet the needs of the Port of Skagway.

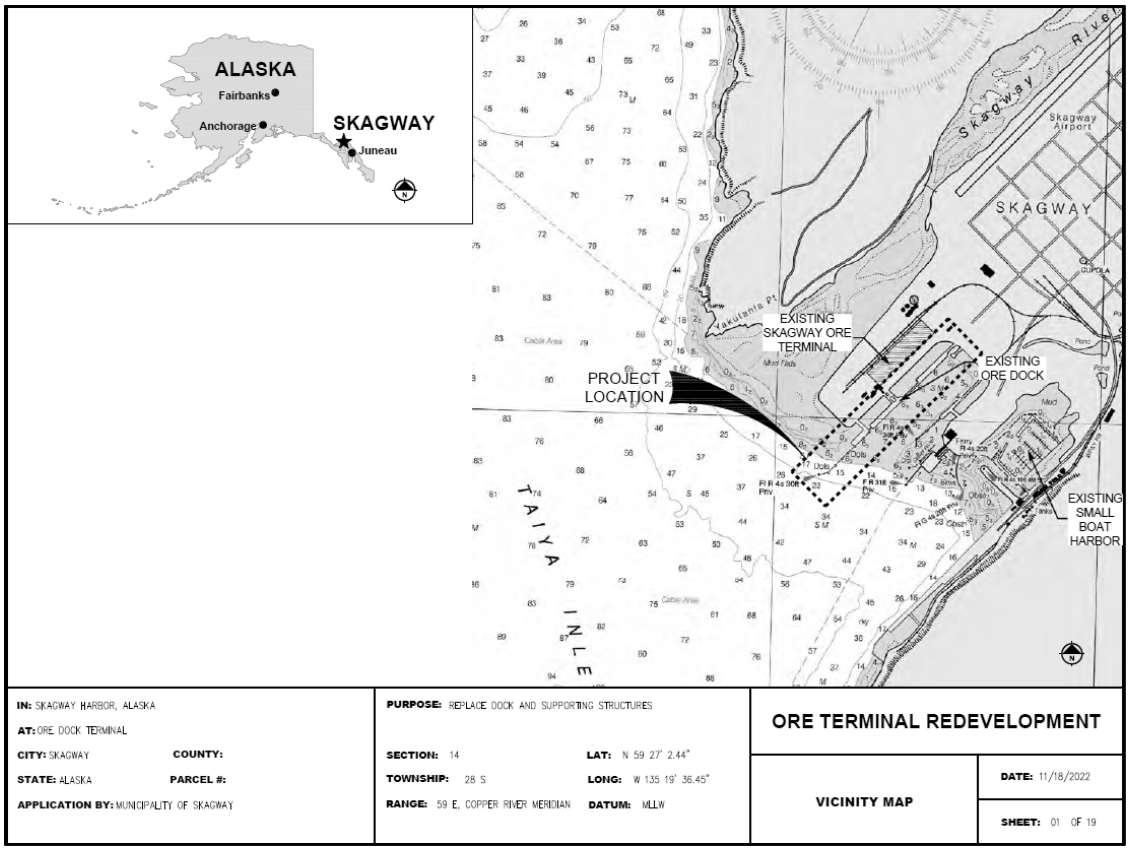



**Figure 1. Skagway Ore Terminal Project Location.**

This opinion considers the effects of pile driving activities, including vibratory and impact pile driving, and vessel transit of materials and construction barges through habitat occupied by ESA-listed marine mammals. These actions have the potential to affect the endangered blue whale (*Balaenoptera musculus),* endangered fin whale (*Balaenoptera physalus*), endangered sei whale (*Balaenoptera borealis*), threatened Mexico distinct population segment (DPS) humpback whale (*Megaptera novaeangliae*), endangered Western North Pacific (WNP) DPS humpback whale (*Megaptera novaeangliae*), endangered North Pacific right whale (*Eubalaena japonica*), endangered sperm whale (*Physeter macrocephalus*), endangered Southern Resident DPS killer whale (*Orcinus orca*), endangered Cook Inlet beluga whale (*Delphinapterus leucas*), endangered Western DPS Steller sea lion (*Eumetopias jubatus*), Steller sea lion critical habitat, Cook Inlet beluga whale critical habitat, Southern Resident DPS killer whale critical habitat, Mexico DPS humpback whale critical habitat, and WNP DPS humpback whale critical habitat. There is no critical habitat for North Pacific right whales in the action area. In addition, the action agency requested a discretionary conference on the proposed threatened listing of the sunflower sea star (*Pycnopodia helianthoides*; 88 FR 16212, March 16, 2023), and requested concurrence with a not likely to adversely affect determination.

## 1.2 Consultation History

- August 9, 2022 – NMFS Permits Division received an IHA application from the Municipality of Skagway (MOS)
- September 30, 2022 – NMFS Alaska Region (AKR) received a letter from the USACE designating Anchor QEA as their non-Federal representative
- November 28, 2022 – NMFS AKR received a Biological Assessment from Anchor QEA
- December 29, 2022 – NMFS AKR received a revised project description
- January 8, 2023 – NMFS AKR submitted questions to Anchor QEA
- January 18, 2023 – Early Review Team (ERT), with participants from the NMFS Permits Division and NMFS AKR, met to discuss the project
- April 4, 2023 – NMFS AKR received an addendum to the BA requesting a discretionary conference on the proposed threatened listing of the sunflower sea star
- April 5, 2023 – Revised IHA application from Anchor QEA received
- April 14, 2023 – NMFS AKR received a request for consultation, draft IHA, and proposed Federal Register Notice (FRN) from the NMFS Permits Division
- April 18, 2023 – Proposed IHA published in the Federal Register
- May 4, 2023 – NMFS AKR submitted questions to Anchor QEA regarding discrepancies between the revised April IHA application and the published FRN
- May 12, 2023 – NMFS AKR met with Anchor QEA and NMFS Permits Division to resolve the revised April IHA application and the published FRN discrepancies
- May 30, 2023 – NMFS AKR met with Anchor QEA and NMFS Permits Division to review mitigation measures
- June 1, 2023 – NMFS AKR met with Anchor QEA to discuss vessel transport of materials/equipment to the project site
- June 13, 2023 – NMFS AKR received an addendum to the BA analyzing transit of project-related vessels and equipment
- June 23, 2023 – NMFS AKR submitted questions to Anchor QEA regarding the vessel transit addendum
- June 27, 2023 – Responses to questions were received from Anchor QEA
- June 27, 2023 – NMFS AKR initiated ESA section 7 consultation
- July 19, 2023 – Revised IHA application from Anchor QEA received

# 2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

## 2.1 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas (50 C.F.R. § 402.02).

This opinion considers the effects of the Skagway Ore Terminal redevelopment project, which involves the removal of existing dock components and installation of new components. The proposed project is located on a seven-acre parcel of waterfront land that includes both the Ore Dock and the associated upland facility at latitude 59.450°N and longitude 135.372°W. The proposed action will also include vessel transit of construction and materials barges to the project site; the materials barges will likely deploy from Seattle, Washington and the construction barges will likely deploy from Seattle, or from Juneau or Anchorage, Alaska.

Pile installation and removal will occur over 196 nonconsecutive days between October 1 and March 31, in order to avoid construction during the cruise ship season. The expected duration for each activity type is estimated in Table 1. When summed, the number of days of activity equals 211.5; however, this was reduced to 196 days based on communication from the MOS. The temporary piles will be installed and/or removed on days that other pile driving is occurring, reducing the number of days of activity by 14.4, and installation of the 24-inch piles in shallow water is expected to be faster than calculated, reducing the days of activity by another 2 days. The project could be completed during one construction season, but may require two. Pile driving will occur intermittently during the work period, for durations of minutes to hours at a time.

The following description of the proposed action derives primarily from the IHA application, the proposed IHA (88 FR 23627, April 18, 2023), and the Biological Assessment with addendums.

### 2.1.1 Proposed Activities

#### 2.1.1.1 Construction Activities

The Ore Dock is heavily used by cargo barges, fuel delivery barges, bulk ore export vessels, and cruise ships. Many of the existing structures at the Ore Terminal are at the end of their useful life or do not serve the current and future needs of the Port of Skagway. The Ore Terminal Redevelopment Project will replace existing in-water and overwater structures and include the following main components (Figure 2, Figure 3):

- Demolition of existing timber, steel, and concrete docks, platforms, walkways, catwalks, and mooring dolphins
- Partial demolition of a concrete dock
- Full demolition of the ore loader and associated platform, fuel header and fuel lines, and overhead electrical lines

- Construction of a 500 x 50 foot steel cruise ship floating dock, gangway, and guide piles
- Reinforcement of existing dolphins
- Installation of new mooring dolphins, fuel header and fuel line pipe bridge, fuel lines, and access catwalks
- Construction of a new roll-on roll-off (RORO) ramp and access trestle, fuel header dolphin, and underground power lines
- Construction of new marine services platform wharf

Two construction barges with cranes and four materials barges will be used to support construction. The tugs are estimated to be approximately 110 feet (ft) long and the barges will range from 100 to 300 ft long. Local barge movements are expected every few days, at a speed of less than five knots (kts), as work progresses. The barges will be moored to existing docks, dolphins, and each other in the construction area.

Pile removal and installation equipment, including a vibratory hammer and impact hammer will be deployed from the construction barges. The impact hammer is expected to be a D100 diesel impact hammer or similar, and the vibratory hammer is expected to be similar to an APE 200 vibratory driver.

The proposed project will remove 423 creosote-treated timber piles and 269 steel piles using a vibratory hammer (Table 1). Piles that break or are already broken below the waterline may be removed with a clamshell bucket, direct pull (using a cable), or by cutting the pile two feet below the mudline. A vibratory hammer will also be used to install and remove 36 temporary steel piles, which will act as supports or reaction frames to facilitate installation of the permanent piles. To support the new dock structure, as part of the mooring dolphins, and as fender piles, 244 permanent steel piles will be installed. Piles will be driven to the maximum depth feasible using a vibratory pile driver and partially driven and proofed using an impact pile driver to reach required depths. Other structures to be installed include the RORO facilities, marine services platform, cruise dock float and ramp, catwalks, and steel caps for the new dolphins. Overwater construction will be accomplished using land- and barge-based cranes, excavators, and other equipment.

Additional project-specific vessel traffic within the construction area will include work boats and the protected species observer (PSO) monitoring vessel. Two work boats ranging from 15 to 40 ft in length are expected to be used in support of construction activities. Work boats may be tied up to the barges or stored in the small boat harbor. The work boats will also be used to transport PSOs to the Kasidaya monitoring station, located five kilometers downstream of the project site. The work boats will transit at a speed of 10 kts or less to the worksite and Kasidaya monitoring station. The 86 ft fishing vessel *Pavlof*, based out of Haines, Alaska, will be deployed during vibratory pile driving to support monitoring of the Level B harassment zones. The *Pavlof* will transit from Haines to lower Taiya Inlet and monitor a 7.5 mile (mi) transect during vibratory installation of the larger piles (≥ 36-inch). During vibratory removal and installation of the smaller piles (≤ 30-inch), the *Pavlof* will transit from Skagway harbor and monitor a one-mile transect along the edge of the Level B zone, which is located approximately four kilometers from the construction site. The monitoring vessel will travel at a top cruising speed of eight knots and will monitor both transects at a speed of approximately four knots.

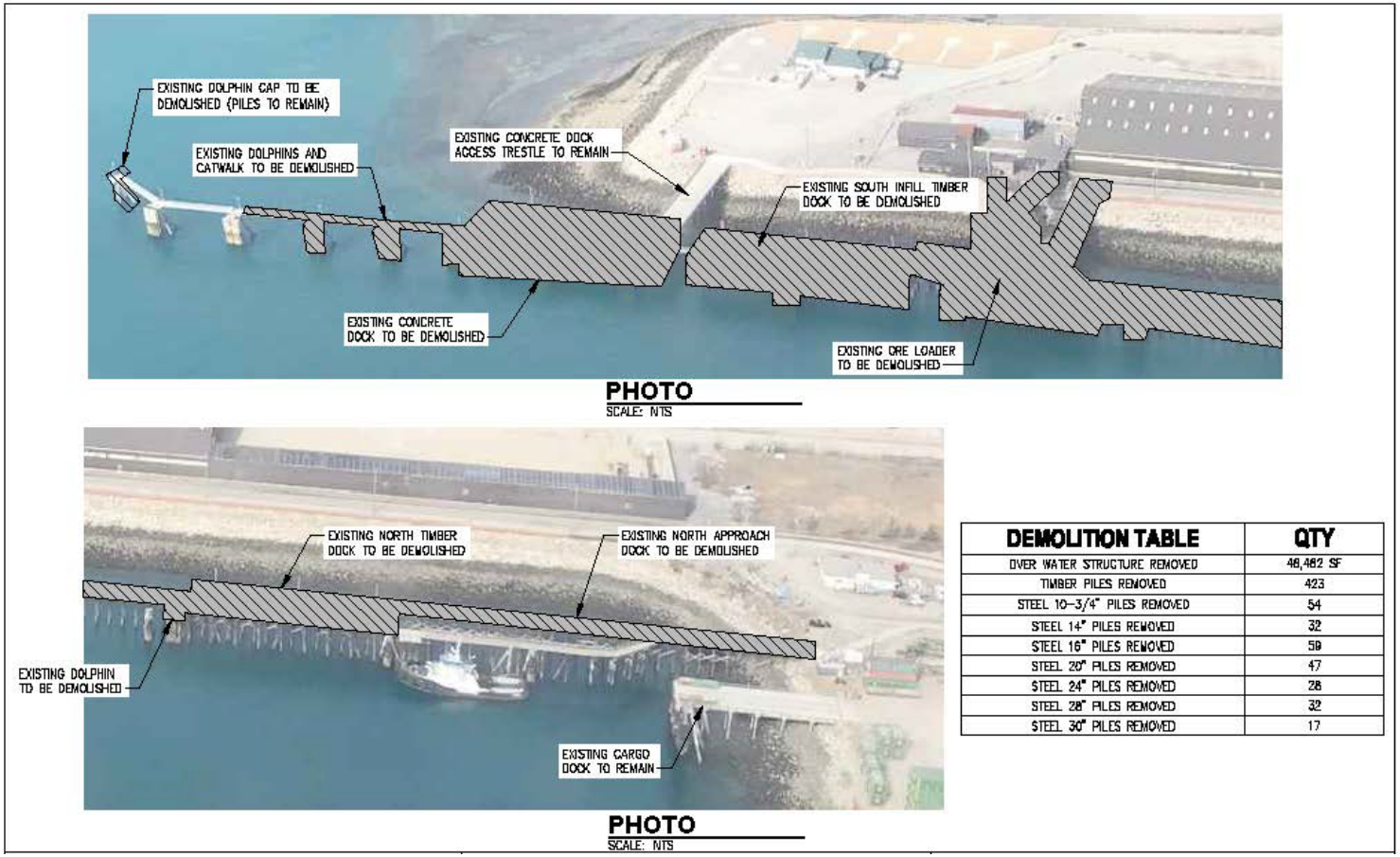
### 2.1.1.2 Transport of Materials and Equipment

Supplies and equipment will be transported to the project site via tug and barge. The materials barges will likely deploy from Seattle, Washington and the construction barges will likely deploy from Seattle, Washington, or from Juneau or Anchorage, Alaska. All barges will be towed at a speed of 10 kts or less.

**Table 1. Ore Terminal Redevelopment Project Pile Driving Summary.**

| Activity | Method | Pile Material | Pile Size | # of Piles[1] | Piles per Day | Days of Activity |
|---|---|---|---|---|---|---|
| Permanent Removal | Vibratory | Timber | ≤ 14-inch | 423 | 18 | 23.5 |
| | | Steel | 10.75-inch | 54 | 5 | 53.8 |
| | | | 14-inch | 32 | | |
| | | | 16-inch | 59 | | |
| | | | 20-inch | 47 | | |
| | | | 24-inch | 28 | | |
| | | | 28-inch | 32 | | |
| | | | 30-inch | 17 | | |
| Permanent Installation | Vibratory | Steel | 24-inch | 170 | 5 | 48.8 |
| | | | 36-inch | 57 | | |
| | | | 42-inch | 11 | | |
| | | | 48-inch | 6 | | |
| | Impact | Steel | 24-inch | 170 | 5 | 34 |
| | | | 36-inch | 57 | 2 | 37 |
| | | | 42-inch | 11 | | |
| | | | 48-inch | 6 | | |
| Temporary Install + Remove | Vibratory | Steel | ≤ 24-inch | 72 | 5 | 14.4 |

[1]In total, 423 timber piles and 269 steel piles will be removed, 244 steel piles will be permanently installed, and 36 temporary piles will be installed and removed.




| DEMOLITION TABLE | QTY |
|---|---|
| OVER WATER STRUCTURE REMOVED | 46,482 SF |
| TIMBER PILES REMOVED | 423 |
| STEEL 10-3/4" PILES REMOVED | 54 |
| STEEL 14" PILES REMOVED | 32 |
| STEEL 16" PILES REMOVED | 59 |
| STEEL 20" PILES REMOVED | 47 |
| STEEL 24" PILES REMOVED | 28 |
| STEEL 28" PILES REMOVED | 32 |
| STEEL 30" PILES REMOVED | 17 |

**Figure 2. Existing Infrastructure at the Ore Terminal.**

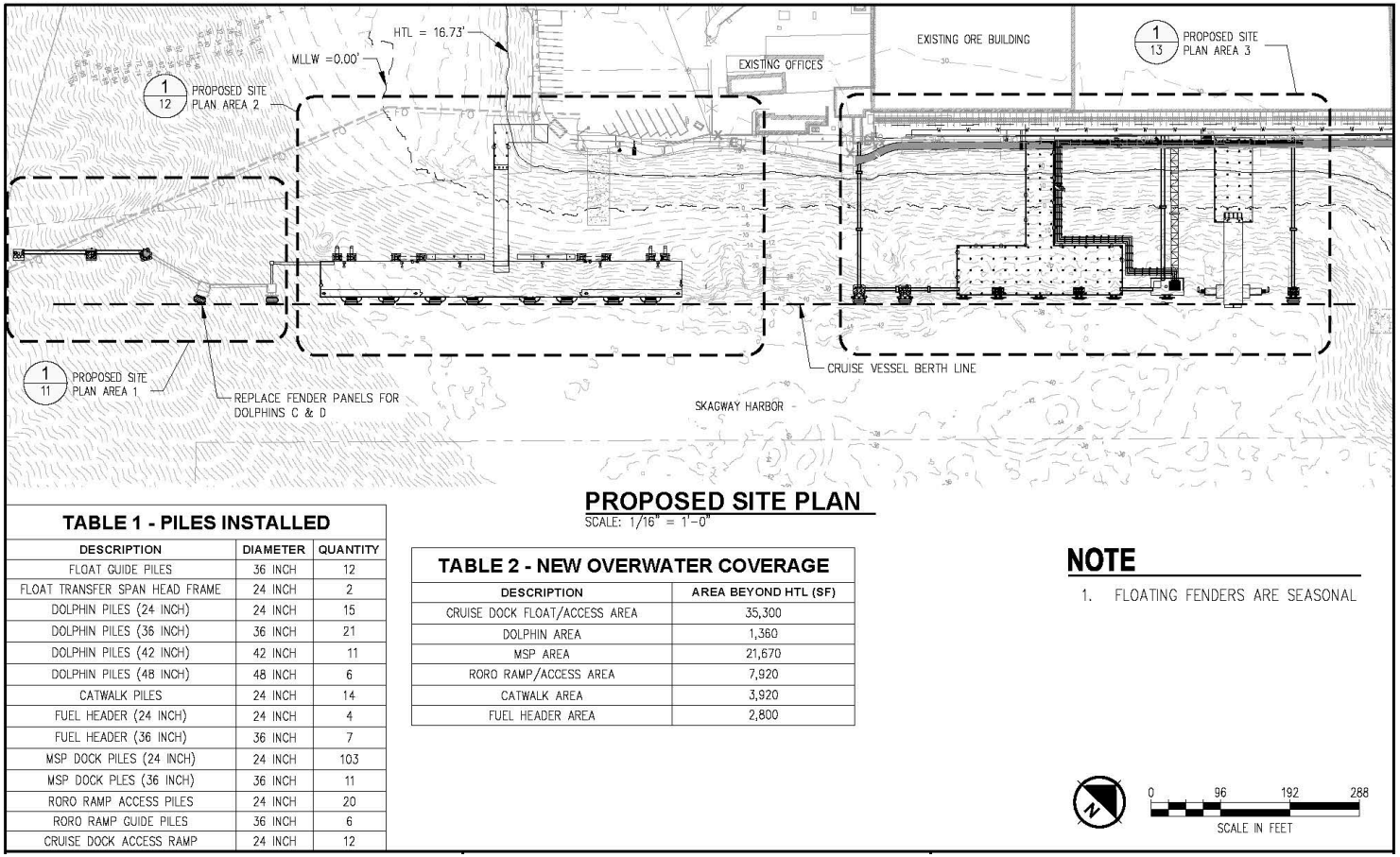



**TABLE 1 - PILES INSTALLED**

| DESCRIPTION | DIAMETER | QUANTITY |
|---|---|---|
| FLOAT GUIDE PILES | 36 INCH | 12 |
| FLOAT TRANSFER SPAN HEAD FRAME | 24 INCH | 2 |
| DOLPHIN PILES (24 INCH) | 24 INCH | 15 |
| DOLPHIN PILES (36 INCH) | 36 INCH | 21 |
| DOLPHIN PILES (42 INCH) | 42 INCH | 11 |
| DOLPHIN PILES (48 INCH) | 48 INCH | 6 |
| CATWALK PILES | 24 INCH | 14 |
| FUEL HEADER (24 INCH) | 24 INCH | 4 |
| FUEL HEADER (36 INCH) | 36 INCH | 7 |
| MSP DOCK PILES (24 INCH) | 24 INCH | 103 |
| MSP DOCK PILES (36 INCH) | 36 INCH | 11 |
| RORO RAMP ACCESS PILES | 24 INCH | 20 |
| RORO RAMP GUIDE PILES | 36 INCH | 6 |
| CRUISE DOCK ACCESS RAMP | 24 INCH | 12 |

**TABLE 2 - NEW OVERWATER COVERAGE**

| DESCRIPTION | AREA BEYOND HTL (SF) |
|---|---|
| CRUISE DOCK FLOAT/ACCESS AREA | 35,300 |
| DOLPHIN AREA | 1,360 |
| MSP AREA | 21,670 |
| RORO RAMP/ACCESS AREA | 7,920 |
| CATWALK AREA | 3,920 |
| FUEL HEADER AREA | 2,800 |

**Figure 3. Proposed Site Plan.**

### 2.1.2 Mitigation Measures

General Mitigation Measures

1. The MOS will inform NMFS of impending in-water activities a minimum of one week prior to the onset of those activities (email information to akr.section7@noaa.gov).
2. If construction activities will occur outside of the time window specified in this letter, the applicant will notify NMFS of the situation at least 60 days prior to the end of the specified time window to allow for reinitiation of consultation.
3. In-water construction will occur between October 1 and March 31, when marine mammals are less likely to occur in the construction action area.
4. Construction of the proposed project will comply with water quality regulations required by the Alaska Department of Environmental Conservation (ADEC).
5. The contractor will be responsible for the preparation and implementation of a Spill Prevention, Control, and Countermeasures Plan to be used for the duration of the Project.
6. No petroleum products, chemicals, or other toxic or deleterious materials will be allowed to enter surface waters.
7. All cast-in-place concrete will be applied within a sealed formwork and concrete will not be allowed contact with the water until fully cured.
8. Demolition and construction materials will not be stored where high tides, wave action, or upland runoff can cause materials to enter surface waters.
9. Excess or waste materials will not be disposed of or abandoned waterward of mean higher high water (MHHW) line or allowed to enter waters of the State.
10. Consistent with AS 46.06.080, trash will be disposed of in accordance with state law. In addition, the contractor will ensure that all closed loops (e.g., packing straps, rings, bands) will be cut prior to disposal. The contractor will also secure all ropes, nets, and other marine mammal entanglement hazards so they cannot enter public waterways.
11. The contractor will be required to retrieve any floating debris generated during construction. Debris will be disposed of at an appropriate upland facility.
12. All creosote-treated materials will be disposed of in a landfill or recycling facility approved to accept these types of materials.
13. Barges will not be allowed to run aground during construction.

Protected Species Observer Related Measures

14. Three to six PSOs will perform PSO duties onsite throughout pile driving activities.
15. For each in-water activity, PSOs will monitor all marine waters within the indicated shutdown zone radius for that activity (Table 2).

**Table 2. Shutdown and Monitoring Zones.**

| Method[1] | Pile Size/Type | Sound Level at 10 m | Shutdown Zone (m) | | Monitoring Zone (m) |
|---|---|---|---|---|---|
| | | | LF Cetaceans | Otariids | |
| Vibratory | ≤ 14-inch[2] Timber | 158 dB rms | 15 | 10 | 3,415 |
| | ≤ 30-inch[3] Steel | 159 dB rms | 15 | 10 | 3,985 |
| | ≥ 36-inch[4] Steel | 170 dB rms | 70 | 10 | 16,300 |
| Impact | 24-inch Steel | 189 dB rms | 1,250 | 50 | 860 |
| | ≥ 36-inch[4] Steel | 193 dB rms | 2,350 | 95 | 1,585 |

[1] Includes installation and removal of permanent and temporary piles.
[2] Includes 11-inch and 14-inch timber piles.
[3] Includes 10.75-inch, 14-inch, 16-inch, 20-inch, 24-inch, 28-inch, and 30-inch piles.
[4] Includes 36-inch, 42-inch, and 48-inch piles.

16. PSOs will be positioned such that they will collectively be able to monitor the entirety of each activity's shutdown zone. The proponent will coordinate with NMFS on the placement of PSOs prior to commencing in-water work.
17. Prior to commencing pile driving activities, PSOs will scan waters within the appropriate shutdown zone and confirm no listed species are within the shutdown zone for at least 30 minutes immediately prior to initiation of the in-water activity. If one or more listed species are observed within the shutdown zone, the in-water activity will not begin until the listed species exit the shutdown zone of their own accord, or the shutdown zone has remained clear of listed species for 30 minutes immediately prior to pile driving activity.
18. The on-duty PSOs will continuously monitor the shutdown zone and adjacent waters during pile driving operations for the presence of listed species.
19. In-water activities will take place only:
    a. between civil dawn and civil dusk when marine mammal monitors can effectively monitor for the presence of marine mammals. Pile driving activities will only continue for a maximum of 30 minutes after sunset during civil twilight, and only as necessary to secure piles prior to demobilization for the evening.
    b. when the entire shutdown zone and adjacent waters are visible (e.g., monitoring effectiveness is not reduced due to environmental/atmospheric conditions).
20. If visibility degrades such that a PSO can no longer ensure that the shutdown zone remains devoid of listed species during pile driving activities, the crew will cease in-water work until the entire shutdown zone is visible and the PSO has indicated that the zone has remained devoid of listed species for 30 minutes.
21. The PSO will order the pile driving activities to immediately cease if one or more listed species has entered, or appears likely to enter, the associated shutdown zone.
22. If pile driving is shut down for less than 30 minutes due to listed-species in the shutdown zone, pile driving activities may commence when the PSO provides assurance that listed species were observed exiting the shutdown zone. Otherwise, the activities may only commence after the PSO provides assurance that listed species have not been seen in the shutdown zone for 30 minutes (for cetaceans) or 15 minutes (for pinnipeds).

23. If a listed species is observed within a shutdown zone or is otherwise harassed, harmed, injured, or disturbed, PSOs will immediately report that occurrence to NMFS using the contact information specified in Table 3.

Protected Species Observer Requirements

24. PSOs will be someone other than the applicant and must have no other assigned tasks during monitoring periods.
25. The action agency or its designated non-federal representative will provide resumes or qualifications of PSO candidates to the NMFS consultation biologist or section 7 coordinator for approval at least one week prior to in-water work. NMFS will provide a brief explanation of lack of approval in instances where an individual is not approved.
26. At least one PSO will have prior experience performing the duties of a PSO during construction activity.
27. PSOs will complete PSO training prior to deployment. Training will include:
    a. field identification of marine mammals and marine mammal behavior;
    b. ecological information on marine mammals and specifics on the ecology and management concerns of those marine mammals;
    c. ESA and MMPA regulations;
    d. proper equipment use;
    e. methodologies in marine mammal observation and data recording and proper reporting protocols; and,
    f. an overview of PSO roles and responsibilities.
28. Where a team of three or more PSOs are required, a lead observer or monitoring coordinator will be designated by the action agency or non-federal representative.
29. PSOs will:
    a. have the ability to effectively communicate orally, by radio and in person, with project personnel in real time;
    b. be able to collect field observations and record field data accurately and in accordance with project protocols, and provide an understandable summary of those observations;
    c. be able to identify protected species that occur in the action area;
    d. record the date, time, species, and coordinates of all observed marine mammals;
    e. have instruments to estimate geographic coordinates of observed marine mammals;
    f. possess a legible copy of this biological opinion and any appendices; and,
    g. possess legible and fillable observation record forms or electronic data sheets allowing for data entry.

30. PSOs will work in shifts lasting no longer than four hours with at least a one-hour break from monitoring duties between shifts. PSOs will not perform PSO duties for more than 12 hours in a 24-hour period.
31. PSOs will have the obligation and authority to order shutdowns and other appropriate mitigation responses to avoid takes of listed species.
32. Prior to commencing in-water work or at changes in watch, PSOs will establish a point of contact with the construction crew. The PSO will brief the point of contact as to the shutdown procedures if listed species are observed likely to enter or within the shutdown zone, and will request that the point of contact instruct the crew to notify the PSO when a marine mammal is observed. If the point of contact goes "off shift" and delegates his duties, the PSO must be informed and brief the new point of contact.

Impact Pile Driving

*Please* see *Table 2 above for required shutdown zones.*

33. If no listed species are observed within the impact pile driving shutdown zone for 30 minutes immediately prior to pile driving, soft-start procedures will be implemented immediately prior to activities. Soft start requires contractors to provide an initial set of strikes at no more than half the operational power, followed by a 30 second waiting period, then two subsequent reduced power strike sets. A soft start must be implemented at the start of each day's impact pile driving, any time pile driving has been shutdown or delayed due the presence of a listed species, and following cessation of pile driving for a period of 30 minutes or longer.
34. Following this soft-start procedure, operational impact pile driving may commence and continue provided listed species remain absent from the shutdown zone.
35. Following a lapse of impact pile driving activities of more than 30 minutes, the PSO will authorize a soft start prior to resumption of impact pile driving only after the PSO provides assurance that listed species have not been present in the shutdown zone for at least 30 minutes immediately prior to resumption of operations.

Vibratory Pile Driving

*Please* see *Table 2 above for required shutdown zones.*

36. If no listed species are observed within the vibratory pile driving shutdown zone for 30 minutes immediately prior to pile driving, vibratory pile driving may commence. This pre-pile driving observation period will take place at the start of each day's vibratory pile driving, each time pile driving has been shut down or delayed due the presence of a listed species, and following cessation of pile driving for a period of 30 minutes or longer.
37. Following a lapse of vibratory pile driving activities of more than 30 minutes, the PSO will authorize resumption of vibratory pile driving only after the PSO provides assurance that listed species have not been present in the shutdown zone for at least 30 minutes immediately prior to resumption of operations.

Project-Dedicated Vessels

38. Vessel operators will:
    a. maintain a watch for marine mammals at all times while underway;
    b. stay at least 91 meters (m; 100 yards [yds]) away from listed marine mammals, and at least 460 m (500 yds) from endangered North Pacific right whales;
    c. travel at less than 5 kts (9 kilometers/hour [km/hr]) when within 274 m (300 yds) of a whale;
    d. avoid changes in direction and speed when within 274 m (300 yds) of a whale, unless doing so is necessary for maritime safety;
    e. not position vessel(s) in the path of a whale, and will not cut in front of a whale in a way or at a distance that causes the whale to change direction of travel or behavior (including breathing/surfacing pattern);
    f. check the waters immediately adjacent to the vessel(s) to ensure that no whales will be injured when the propellers are engaged; and,
    g. reduce vessel speed to 10 kts (18.5 km/hr) or less when weather conditions reduce visibility to 1.6 km (1 mi) or less.
39. Adhere to the Alaska Humpback Whale Approach Regulations when vessels are transiting to and from the project site: (see 50 CFR §§ 216.18, 223.214, and 224.103(b)). Specifically, pilot and crew will not:
    a. approach, by any means, including by interception (i.e., placing a vessel in the path of a humpback whale), within 91 m (100 yds) of a humpback;
    b. cause a vessel or other object to approach within 91 m (100 yds) of a humpback;
    c. disrupt the normal behavior or prior activity of a humpback.
40. If a whale's course and speed are such that it will likely cross in front of a vessel that is underway, or approach within 91 m (100 yds) of the vessel, and if maritime conditions safely allow, the engine will be put in neutral and the whale will be allowed to pass beyond the vessel. Vessels will remain 460 m (500 yds) from North Pacific right whales.
41. Vessels will take reasonable steps to alert other vessels in the vicinity of a whale(s).
42. Vessels will not allow lines to remain in the water unless both ends are under tension and affixed to vessels or gear. No materials capable of becoming entangled around marine mammals will be discarded into marine waters.

Vessel Transit, Western DPS Steller Sea Lions, and their Critical Habitat

43. Vessels will not approach within 5.5 km (3 nautical miles [nm]) of rookery sites listed in 50 CFR § 224.103(d).
44. Vessels will not approach within 914 m (3,000 ft) of any Steller sea lion haulout or rookery which is not listed in 50 CFR § 224.103(d).

Vessel Transit, Cook Inlet Beluga Whales, and their Critical Habitat

45. Project vessel(s) operating in Cook Inlet will maintain a distance of at least 2.4 km (1.5 miles [mi]) south of the mean lower low water (MLLW) line between the Little Susitna River and Beluga River (Figure 4, blue line).

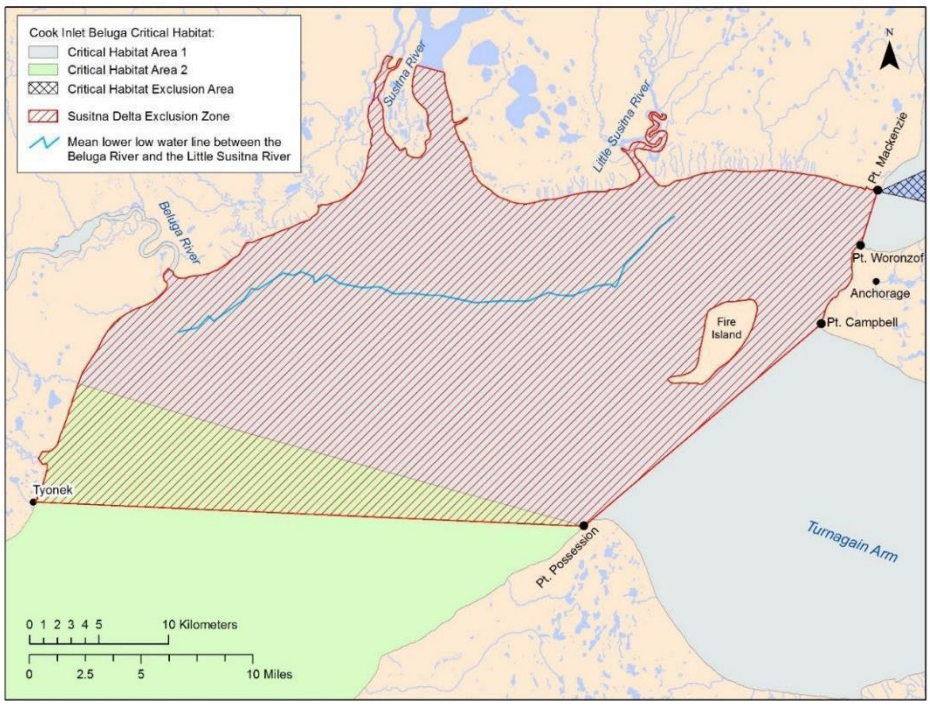



**Figure 4. Susitna Delta Exclusion Zone.**

General Data Collection and Reporting

*Data Collection*

46. PSOs will record observations on data forms or into electronic data sheets.
47. The project proponent will ensure that PSO data will be submitted electronically in a format that can be queried such as a spreadsheet or database.
48. PSOs will record the following:
    a. date, shift start and stop time, PSO identifier;
    b. date and time of each reportable event (e.g., shutdown, change in weather);
    c. weather parameters (e.g., visibility, percent glare, percent cloud cover) and sea state where the Beaufort Wind Force Scale will be used to determine sea-state (https://www.weather.gov/mfl/beaufort);
    d. marine mammal observations, including date, time, geographic coordinates, species, numbers, and, if possible, sex and age class;
    e. the predominant anthropogenic sound-producing activities occurring during each marine mammal observation;

f. observations of marine mammal behaviors and reactions to anthropogenic sounds and presence;

g. bearing and direction of travel of observed marine mammal(s);

h. initial, closest, and last location of marine mammals, including distance from observer to the marine mammal, and minimum distance from the predominant sound-producing activity or activities to marine mammals; and,

i. whether mitigation measures were implemented to avoid acoustic impact to marine mammals, and the duration of time that operations were affected by the presence of marine mammals.

*Data Reporting*

49. The project proponent will ensure that all observations of North Pacific right whales are reported to akr.section7@noaa.gov within 24 hours. These observation reports will include the following information:

    a. photographs (especially of the head) and video obtained;

    b. date, time, and geographic coordinates of the observation(s);

    c. number of North Pacific right whales observed, including number of adults/juveniles/calves observed, if determinable; and,

    d. environmental conditions during each observation event, including sea conditions, weather conditions, visibility, lighting conditions, and percent ice cover.

50. Observations of humpback whales will be transmitted to akr.section7@noaa.gov by the end of the calendar year, including:

    a. photographs (especially flukes) and video obtained;

    b. geographic coordinates for the observed animals;

    c. number of humpback whales observed, including number of adults/juveniles/calves (if determinable); and,

    d. environmental conditions during each observation event, including sea conditions, weather conditions, visibility, lighting conditions, and percent ice cover.

*Unauthorized Take (project-related)*

51. If a listed marine mammal is determined by the PSO to have been disturbed, harassed, harmed, injured, or killed (e.g., a listed marine mammal(s) is observed entering a shutdown zone before operations can be shut down, or is injured or killed as a direct or indirect result of this action), the PSO will report the incident to NMFS within one business day, with information submitted to akr.section7@noaa.gov. These PSO records will include:

    a. all information to be provided in the final report (see below):

    b. number of animals of each threatened and endangered species affected;

    c. the date, time, and location of each event (provide geographic coordinates);

d. description of the event;

e. the time the animal(s) was first observed or entered the shutdown zone, the time the animal was last seen or exited the zone, and the fate of the animal;

f. mitigation measures implemented prior to and after the animal was taken;

g. if a vessel struck a marine mammal, the contact information for the PSO on duty or the individual piloting the vessel, if there was no PSO on duty; and,

h. photographs or video footage of the animal(s), if available.

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

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

*Illegal Activities*

53. If PSOs observe marine mammals being disturbed, harassed, harmed, injured, or killed (e.g., feeding or unauthorized harassment), these activities will be reported to NMFS Alaska Region Office of Law Enforcement at (Table 3; 1-800-853-1964).

54. Data submitted to NMFS will include date/time, location, description of the event, and any photos or videos taken.

*Monthly Reports*

55. Submit interim monthly PSO monitoring reports, including digital, queryable documents. These reports will include a summary of marine mammal species and behavioral observations, shutdowns or delays, and work completed.

56. Monthly reports will be submitted to akr.section7@noaa.gov by the 15$^{th}$ day of the month following the reporting period. For example, the report for activities conducted in October 2023 will be submitted by November 15, 2023.

*Final Report*

57. A final report will be submitted to NMFS within 90 calendar days of the completion of the project summarizing the data recorded and submitted to akr.section7@noaa.gov. The report will summarize all in-water activities associated with the proposed action, and results of PSO monitoring conducted during the in-water project activities.

58. The final report will include:

a. dates and times of monitoring, dates and times of construction, dates, times, and duration of shutdowns due to marine mammal presence;

b. date and time of marine mammal observations, geographic coordinates of marine

mammals at their closest approach to the project site, marine mammal species, numbers, age/sex categories (if determinable), and group sizes;

c. number of marine mammals observed (by species) during periods with and without project activities (and other variables that could affect detectability);

d. observed marine mammal behaviors and movement types versus project activity at time of observation;

e. numbers of marine mammal observations/individuals seen versus project activity at time of observation;

f. distribution of marine mammals around the action area versus project activity at time of observation; and,

g. digital, queryable documents containing PSO observations and records, and digital, queryable reports.

**Table 3. Agency Contact Information**

| **Reason for Contact** | **Contact Information** |
|---|---|
| Request S7 Consultation | AKR.PRD.Section7@noaa.gov |
| Consultation Questions & Unauthorized Take | akr.prd.section7@noaa.gov<br>Kathleen Leonard: (kathleen.leonard@noaa.gov) |
| Reports & Data Submittal | AKR.section7@noaa.gov (please include NMFS AKRO tracking number AKRO-2022-02952 in subject line) |
| Stranded, Injured, Entangled or Dead Marine Mammal *(not related to project activities)* | NOAA Fisheries Stranding Hotline (24/7 coverage) 877-925-7773 |
| Oil Spill & Hazardous Materials Response | U.S. Coast Guard National Response Center 1-800-424-8802<br>AKRNMFSspillResponse@noaa.gov |
| Illegal Activities *(not related to project activities; e.g., feeding, unauthorized harassment, or disturbance to marine mammals)* | NMFS Office of Law Enforcement (AK Hotline) 1-800-853-1964 |
| In the event that this contact information becomes obsolete | NMFS Anchorage Main Office: 907-271-5006<br>NMFS Juneau Main Office: 907-586-7236 |

## 2.2 Action Area

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

The Skagway Ore Terminal, located along the northern end of the Ore Basin, is a deep-water port that transitions sharply from a limited nearshore area into deep marine waters. The Ore Basin is an industrial waterway located within Taiya Inlet at the western edge of the Municipality of Skagway in Southeast Alaska. Taiya Inlet, part of the upper Lynn Canal, is approximately 21.5 km long and just over 2 km across at the widest point.

NMFS defines the action area for this consultation to include the area within which project-related noise levels exceed 120 dB re 1 µPa root mean square (rms), and are expected to approach ambient noise levels (i.e., the point where no measurable effect from the project would occur). To define the action area, we considered the maximum diameter and type of piles, the pile-driving methods, and empirical measurements of noise. Received sound levels associated with vibratory pile driving for all pile sizes are expected to decline to 120 dB re 1µPa rms within 21,544 m of the source, see the Acoustic Threshold section for more information on the factors included in this calculation. The land mass structure of Taiya Inlet, however, obstructs underwater sound transmission and the action area for pile driving activities is truncated to 16,300 m (Figure 5).

The expected transit routes of the materials and construction barges are also considered part of the action area. The materials barges will likely be towed from Seattle, Washington and the construction barges will likely be towed from Seattle, Washington, or from Juneau or Anchorage, Alaska, to the Skagway project site (Figure 6).

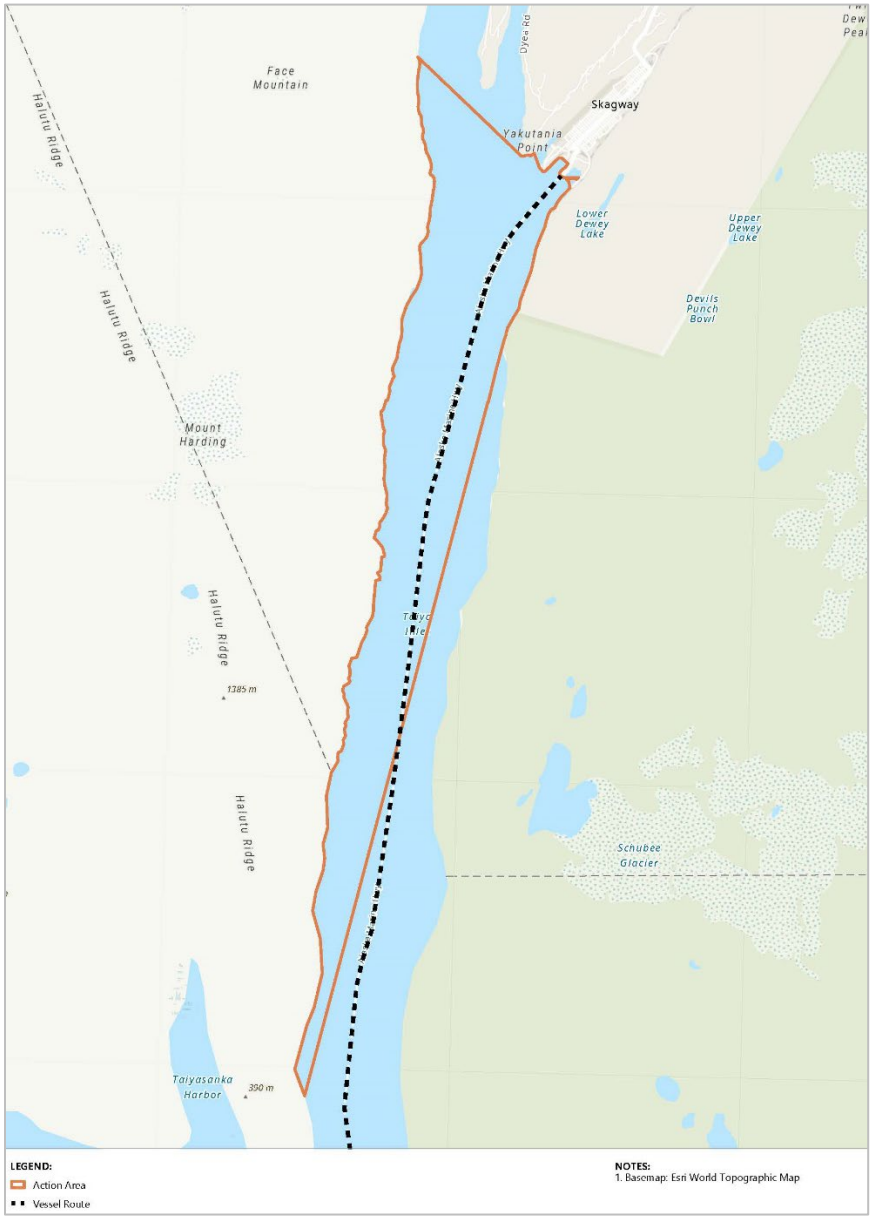



**Figure 5. Skagway Ore Terminal Redevelopment Project Construction Action Area.**


**Figure 6. Approximate Routes for Construction and Materials Barges.**

# 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).

Under NMFS's regulations, the destruction or adverse modification of critical habitat means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species (50 CFR § 402.02).

The designations of critical habitat for Steller sea lions and Cook Inlet belugas use the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (81 FR 7414; February 11, 2016) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, our use of the term PBF also applies to Primary Constituent Elements and essential features.

We use the following approach to determine if the proposed action described in Section 2 of this opinion is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify those aspects (or stressors) of the proposed action that are likely to have effects on listed species or critical habitat. As part of this step, we identify the action area – the spatial and temporal extent of these effects.

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action. This section describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the range-wide status of critical habitat by examining the condition of its PBFs - which were identified when the critical habitat was designated. Species and critical habitat status are discussed in Section 4 of this opinion.

- Describe the environmental baseline including: past and present impacts of Federal, state, or private actions and other human activities *in the action area*; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7

consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process. The environmental baseline is discussed in Section 5 of this opinion.

- Analyze the effects of the proposed action. 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 sex of the individuals that are likely to be exposed to stressors and the populations or subpopulations those individuals represent. NMFS also evaluates the proposed action's effects on critical habitat PBFs. The effects of the action are described in Section 6 of this opinion with the exposure analysis described in Section 6.2 of this opinion.

- Once we identify which listed species are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed species are likely to respond given their exposure (these represent our *response analyses*). Response analysis is considered in Section 6.3 of this opinion.

- Describe any cumulative effects. Cumulative effects, as defined in NMFS's implementing regulations (50 CFR § 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation. Cumulative effects are considered in Section 7 of this opinion.

- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat. In this step, NMFS adds the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to assess whether the action could reasonably be expected to: (1) appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 4). Integration and synthesis with risk analyses occurs in Section 8 of this opinion.

- Reach jeopardy and adverse modification conclusions. Conclusions regarding jeopardy and the destruction or adverse modification of critical habitat are presented in Section 9. These conclusions flow from the logic and rationale presented in the Integration and Synthesis Section 8.

- If necessary, define a reasonable and prudent alternative to the proposed action. If, in completing the last step in the analysis, NMFS determines that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, NMFS must identify a reasonable and prudent alternative (RPA) to the action.

# 4 RANGEWIDE STATUS OF THE SPECIES AND CRITICAL HABITAT

This opinion considers the effects of the proposed action on the species and designated critical habitats specified in Table 4. Project-specific barges will be towed from Seattle, Juneau, or Anchorage to the project site. The proposed vessel route from Seattle is expected to transit through designated critical habitat for Southern Resident DPS killer whales. The proposed vessel route from Anchorage is expected to transit through designated critical habitat for Cook Inlet beluga whales, Steller sea lions, and Mexico DPS and WNP DPS humpback whales. The nearest designated critical habitat for North Pacific right whales is more than 200 km southwest of the proposed vessel route from Anchorage to the project site. The nearest designated critical habitat to the project site is the Gran Point Steller sea lion haulout located approximately 36 km downstream in Lynn Canal.

**Table 4. Listing status and critical habitat designation for species considered in this opinion.[1]**

| Species | Status | Listing | Critical Habitat |
|---|---|---|---|
| Steller Sea Lion, Western DPS *(Eumetopias jubatus)* | Endangered | NMFS 1997, 62 FR 24345 | NMFS 1993, 58 FR 45269 |
| Humpback Whale, Mexico DPS *(Megaptera novaeangliae)* | Threatened | NMFS 2016, 81 FR 62259 | NMFS 2021 86 FR 21082 |
| Blue whale (*Balaenoptera musculus*) | Endangered | NMFS 1970, 35 FR 18319 | Not designated |
| Fin Whale (*Balaneoptera physalus*) | Endangered | NMFS 1970, 35 FR 18319 | Not designated |
| Sei whale (*Balaenoptera borealis*) | Endangered | NMFS 1970, 35 FR 18319 | Not designated |
| Humpback Whale, Western North Pacific DPS *(Megaptera novaeangliae)* | Endangered | NMFS 2016, 81 FR 62259 | NMFS 2021 86 FR 21082 |
| North Pacific Right Whale *(Eubalaena japonica)* | Endangered | NMFS 2008, 73 FR 12024 | NMFS 2008, 73 FR 19000 |
| Sperm Whale (*Physeter macrocephalus*) | Endangered | NMFS 1970, 35 FR 18319 | Not designated |
| Killer whale, Southern Resident DPS (*Orcinus orca*) | Endangered | NMFS 2015 80 FR 7380 | NMFS 2021, 71 FR 69054 |
| Cook Inlet beluga whale (*Delphinapterus leucas*) | Endangered | NMFS 2008, 73 FR 62919 | NMFS 2011, 76 FR 20180 |
| Sunflower Sea Star (*Pycnopodia helianthoides*) | Proposed | NMFS 2023, 88 FR 16212 | Not designated |

[1] The years provided in the table indicate the publication date of when the species was listed and critical habitat was designated, as opposed to the effective date. Revised and amended species listings and critical habitat designations are also provided in the table.

## 4.1 Species and Critical Habitat Not Likely to be Adversely Affected by the Action

As described in the Approach to the Assessment section of this opinion, NMFS uses two criteria to identify those proposed, endangered, or threatened species, or critical habitats that are likely to be adversely affected. The first criterion is exposure or some reasonable expectation of a co-occurrence between one or more potential stressors associated with the proposed activities and a proposed or listed species, or designated critical habitat.

The second criterion is the probability of a response given exposure. For proposed, endangered, or threatened species, we consider the susceptibility of the species that may be exposed. For example, species exposed to vessel sound that are not likely to exhibit physical, physiological, or behavioral responses given that exposure (at the combination of sound pressure levels and distances associated with an exposure), are unlikely adversely affected by the exposure. We determine that an action would not likely adversely affect an animal if one could not meaningfully measure or detect the effects, or if the effects are extremely unlikely to occur. In addition, if proposed activities are not likely to destroy or adversely modify critical habitat, further analysis is not required.

We applied these criteria to the species and critical habitats listed above and determined that the following species and designated critical habitats are not likely to be adversely affected by the proposed action: blue whale, fin whale, sei whale, WNP DPS humpback whale, North Pacific right whale, sperm whale, Southern Resident DPS killer whale, Cook Inlet beluga whale, sunflower sea star, Mexico DPS humpback whale critical habitat, WNP DPS humpback whale critical habitat, Southern Resident DPS killer whale critical habitat, Cook Inlet beluga whale critical habitat, and Steller sea lion critical habitat. Below we discuss our rationale for those determinations.

### 4.1.1 Blue Whale, Fin Whale, Sei Whale, WNP DPS Humpback Whale, North Pacific Right Whale, Sperm Whale, Southern Resident DPS Killer Whale, Cook Inlet Beluga Whale

#### 4.1.1.1 Vessel Traffic

The materials and construction barges will deploy from Seattle, Juneau, or Anchorage to the project site in Skagway. The proposed routes overlap with the ranges of the blue whale, fin whale, sei whale, WNP DPS humpback whale, North Pacific right whale, sperm whale, Southern Resident DPS killer whale, and Cook Inlet beluga whale, and these species may be encountered during transit. All barges will be towed at a speed of 10 kts or less; the typical transit speed is between 6 and 9 kts. Project vessels will have a short-term presence in the North Pacific and possibly Gulf of Alaska (GOA). Potential effects from project vessel traffic on these ESA-listed species includes auditory and visual disturbance and vessel strike.

Mitigation measures (Section 2.1.2) will be implemented to minimize or avoid auditory and visual disturbance and potential vessel collisions with marine mammals during project activities. These mitigation measures include, but are not limited to, maintaining a vigilant watch aboard vessels for listed marine mammals and avoiding potential interactions with whales by

implementing a five-knot speed restriction when within 300 yards of observed whales. Project vessels will also be maneuvered to keep at least 500 yards away from any observed North Pacific right whales, 100 yards from other marine mammals, and avoid approaching whales in a manner that causes them to change direction or separate from other whales in their group.

Although some marine mammals could receive sound levels in exceedance of the acoustic threshold of 120 dB from the project vessels or be disturbed by the visual presence of barges and tugs, disturbances rising to the level of harassment are extremely unlikely to occur.

NMFS has interpreted the term “harass” in the Interim Guidance on the ESA Term "Harass" (Wieting 2016) as to “create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.” While listed marine mammals will likely be exposed to acoustic stressors from barging activities, the nature of the exposure (primarily vessel noise) will be low-frequency, with much of the acoustic energy emitted by project vessels at frequencies below the best hearing ranges of many large baleen whales. In addition, because vessels will be in transit, the duration of the exposure to ship noise will be brief. The project vessels will emit continuous sound while in transit, which will alert marine mammals before the received sound level exceeds 120 dB. Therefore, a startle response is not expected. Rather, slight deflection and avoidance are expected to be common responses in those instances where there is any response at all. The implementation of mitigation measures is expected to further reduce the number of times marine mammals react to transiting vessels.

The factors discussed above, when considered as a whole, make it extremely unlikely that transiting vessels will elicit behavioral responses from, or have adverse effects on, blue whales, fin whales, sei whales, WNP DPS humpback whales, North Pacific right whales, sperm whales, Southern Resident DPS killer whales, and Cook Inlet beluga whales that rise to the level of harassment under the ESA (Wieting 2016). We expect any effects to listed species to have little consequence and not to significantly disrupt normal behavioral patterns.

Vessel strike is an ongoing source of mortality for large cetaceans (Vanderlaan and Taggart 2007, Schoeman et al. 2020) and vessel speed is a principal factor in whether a strike results in death (Laist et al. 2001, Vanderlaan and Taggart 2007). From 1978 to 2011, 108 whale-vessel collisions were recorded in Alaska; humpback whales were the most frequent victims, accounting for 86 percent of all reported collisions (Neilson et al. 2012). The majority of reported vessel strikes occurred in Southeast Alaska where vessel traffic is much greater (Neilson et al. 2012). The probability of encountering a humpback whale from the WNP DPS in the Gulf of Alaska is one percent and approaches zero percent in Southeast Alaska (Wade 2021).

Twenty-six large whale-vessel strikes were reported between 2016 and 2020 in Alaska: 18 humpback, 3 fin, 2 sperm, and 3 unidentified whales (Freed et al. 2022). There have been no reported strikes of blue whales, sei whales, or North Pacific right whales in Alaska since 1978; however, the reported unidentified whale strikes could potentially include these species (Neilson et al. 2012, NMFS Alaska Regional Office Stranding Database accessed July 2023, Delean et al. 2020, Young et al. 2020, Freed et al. 2022). Two Cook Inlet beluga whale deaths, one in 2007 and one in 2012, were attributed to potential vessel strikes based on bruising consistent with

blunt force injuries (NMFS 2008a, NMFS unpublished data). Southern Resident DPS killer whale L98 was killed during a vessel interaction in 2006 and J34 was found dead in 2016 with injuries consistent with those incurred during a vessel strike (Carretta et al. 2023).

The probability of strike events depends on the frequency, speed, and route of the marine vessels, and the distribution and density of marine mammals in the area, as well as other factors. With the low number of vessel trips, transitory nature of project-related vessel traffic, slow transit speeds, implementation of the mitigation measures, and the low occurrence of these whale species over the majority of the route, we conclude the probability of a project vessel striking a blue whale, fin whale, sei whale, WNP DPS humpback whale, North Pacific right whale, sperm whale, Southern Resident DPS killer whale, or Cook Inlet beluga whale is extremely low and any adverse effects due to vessel strikes are extremely unlikely to occur.

In summary, we conclude that vessel traffic associated with the proposed action is not likely to adversely affect blue whales, fin whales, sei whales, WNP DPS humpback whales, North Pacific right whales, sperm whales, Southern Resident DPS killer whales, or Cook Inlet beluga whales.

#### 4.1.1.2 Pile Driving Activities

The proposed project is located on a seven-acre parcel of waterfront land at the western edge of the Municipality of Skagway in Southeast Alaska. The land mass structure of Taiya Inlet obstructs underwater sound transmission, and the action area for pile driving activities is truncated to 16,300 m (Figure 5). We are unaware of records of blue whales, sei whales, North Pacific right whales, Southern Resident DPS killer whales, and Cook Inlet beluga whales occurring in Taiya Inlet, and these species are not expected to occur in the area affected by pile driving activities. Therefore, adverse effects to those species are extremely unlikely.

Local observations indicate humpback whales occur in Taiya Inlet, most commonly during the eulachon run in April and May (outside of the planned construction season) in relatively low numbers and for brief periods of time (NMFS 2019). Additionally, the probability of encountering a humpback whale from the WNP DPS in Southeast Alaska approaches zero percent (Wade 2021). Nearshore waters are not typical sperm whale habitat and there have been rare sightings south of the construction action area; three individual sperm whales were observed and photographed in Chatham Strait and Lynn Canal.[1] Similarly, small numbers of fin whales have been observed in the Inside Passage, and the annual mean density is 0.0001 animals/km$^2$ in the Behm Canal.[2] While these three species may occur infrequently in the surrounding waters, they are not expected to occur in the area affected by pile driving activities, and adverse effects to WNP DPS humpback whales, sperm whales, and fin whales are extremely unlikely.

In summary, NMFS concludes that pile driving activities associated with the proposed action are not likely to adversely affect the blue whale, fin whale, sei whale, WNP DPS humpback whale, North Pacific right whale, sperm whale, Southern Resident DPS killer whale, and Cook Inlet

[1] https://www.fisheries.noaa.gov/feature-story/alaska-noaa-team-examines-dead-endangered-sperm-whale accessed July 2023.
[2] https://seamap.env.duke.edu/models/mapper/PACGOA?species=Fin%20whale&region=NWTT_Behm accessed July 2023.

beluga whale. These species will not be discussed further.

### 4.1.2 Effects to Critical Habitat

The proposed action is not likely to adversely affect critical habitat for Southern Resident DPS killer whales, Mexico DPS and WNP DPS humpback whales, Steller sea lions, and Cook Inlet beluga whales for the reasons discussed below.

Project-specific barges will pass through critical habitat for the Southern Resident DPS killer whale during the transit to/from Seattle, Washington, and may pass through critical habitat for the Mexico DPS and WNP DPS humpback whale, Steller sea lion, and Cook Inlet beluga whale, if project vessels deploy from Anchorage, Alaska.

NMFS published a final rule to designate critical habitat for Southern Resident DPS killer whales on November 29, 2006 (71 FR 69054). On August 2, 2021, NMFS published a revision to that rule designating six additional coastal areas along the U.S. West Coast (86 FR 41668). The newly designated critical habitat areas are outside of the vessel transit action area. The following physical or biological features were identified as essential to the conservation of the Southern Resident DPS killer whale:

1. Water quality to support growth and development
2. Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth
3. Passage conditions to allow for migration, resting, and foraging

Project vessels have the potential for unauthorized spills. However, a large spill is unlikely and a small spill would likely disperse quickly due to tide-induced turbulence and mixing. We expect no toxins to be released into the environment that would be of a quantity to impact water quality. Vessel passage on the surface of the water is not expected to disrupt or disturb any of the primary prey species and prey resource quality will not be diminished. The sound and presence of project vessels could cause killer whales to avoid or abandon certain areas; however, the duration of exposure to the vessels and associated noise will be brief and temporary, lasting on the order of minutes. The impact of project-specific vessel transit on Southern Resident DPS killer whale passage is very unlikely. Limited project-specific vessel transit through this highly industrialized waterway will not negatively affect the essential features of designated critical habitat.

Critical habitat was designated for the Mexico DPS and WNP DPS humpback whale on April 21, 2021 (86 FR 21082). Only one PBF was identified: adequate prey resources. Although humpback whales are generalist predators and prey availability can vary seasonally and spatially, data indicate that their diet is consistently dominated by euphausiid species and small pelagic fishes such as northern anchovy, Pacific herring, Pacific sardine, and capelin (84 FR 54354). We do not expect that the passage of a vessel on the surface of the water will have a measureable effect on aggregations of these prey species. The eddies or wake of the vessels across the surface of the water may cause temporary mixing or displacement of a relatively small number of zooplankton, but we do not expect that this disturbance would affect the prey distribution or abundance in a meaningful or measurable way.

NMFS designated critical habitat for Steller sea lions on August 27, 1993 (58 FR 45269). The following essential features were identified at the time of listing:

1. Alaska rookeries, haulouts, and associated areas identified in 50 CFR 226.202(a), including:
    a. Terrestrial zones that extend 914 m (3,000 ft) landward
    b. Air zones that extend 914 m (3,000 ft) above the terrestrial zone
    c. Aquatic zones that extend 914 m (3,000 ft) seaward from each major rookery and major haulout east of 144° W longitude
    d. Aquatic zones that extend 37 km (20 nm) seaward from each major rookery and major haulout west of 144° W longitude
2. Three special aquatic foraging areas identified in 50 CFR 226.202(c):
    a. Shelikof Strait
    b. Bogoslof
    c. Seguam Pass

Mitigation measures #43 and #44 are in place to protect Steller sea lion critical habitat from vessel disturbance. In addition, we expect the project vessels will be traveling in normal shipping lanes when in Steller sea lion range and that Steller sea lions at haulouts or rookeries near those shipping lanes are habituated to shipping traffic. The passage of a vessel on the surface of the water is not expected to disrupt or disturb any of the primary prey species which Steller sea lions depend upon and, therefore, the quality of their prey resources will not be diminished. For these reasons we conclude that there is no aspect of the passage of the project-specific vessels over or near critical habitat that will negatively impact the essential features of Steller sea lion critical habitat.

NMFS designated critical habitat for the Cook Inlet beluga whale on April 11, 2011 (76 FR 20180). Cook Inlet beluga whale critical habitat includes five primary constituent elements (PCEs), more recently and henceforth referred to as physical or biological features (PBFs) deemed essential to the conservation of the Cook Inlet beluga whale (50 CFR § 226.220(c)):

1. Intertidal and subtidal waters of Cook Inlet with depths <30 ft (MLLW) and within 8 km (5 mi) of high and medium flow anadromous fish streams
2. Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole
3. Waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales
4. Unrestricted passage within or between the critical habitat areas
5. Waters with in-water noise below levels resulting in the abandonment of critical habitat areas by Cook Inlet beluga whales

Project vessels are expected to travel in normal shipping lanes in Cook Inlet, which are located outside of PBF #1. The passage of a vessel on the surface of the water is not expected to disrupt or disturb any of the primary prey species listed in PBF #2, and prey resource quality will not be diminished. Unauthorized spills could occur; however, a large spill is extremely unlikely, and a

small spill is expected to rapidly disperse due to tide-induced turbulence and mixing. We do not expect toxins to be released into the environment in amounts that would be harmful to Cook Inlet belugas, and any adverse effects to PBF #3 are improbable. The sound and presence of project vessels could cause belugas to avoid or abandon certain areas; however, the duration of exposure to the vessel and associated noise will be brief and temporary, lasting on the order of minutes. The impact of project-specific vessel transit on beluga passage and occurrence is very unlikely, and adverse effects to PBF #4 and PBF #5 are extremely unlikely to occur. For these reasons, we determine that there is no aspect of the vessel transit through critical habitat that will negatively impact the essential features of Cook Inlet beluga critical habitat.

In summary, we find that the temporary passage of the materials and construction barges over the water surface of critical habitat for Southern Resident DPS killer whales, Mexico and WNP DPS humpback whales, Steller sea lions, and Cook Inlet beluga whales will have an immeasurably small effect on the features determined to be essential for these species.

The ensonfied action area for pile driving activities does not overlap with designated critical habitat. The nearest critical habitat is the Gran Point Steller sea lion haulout located approximately 22 km southeast of the end of the construction action area. Based on the distance of the construction site from major haulouts and rookeries, we expect any adverse effects to designated critical habitat for Steller sea lions would be immeasurably small.

Therefore, we conclude that the proposed action is not likely to adversely affect critical habitat for Southern Resident DPS killer whales, Mexico DPS and WNP DPS humpback whales, Steller sea lions, and Cook Inlet beluga whales. As such, critical habitat will not be discussed further in this opinion.

### 4.1.3 Sunflower Sea Star

#### 4.1.3.1 Sea Star Wasting Syndrome

Sea star wasting syndrome (SSWS) has been, and continues to be, the primary stressor threatening the continued existence of the sunflower sea star (Lowry et al. 2022). The causative agent of SSWS is currently unknown and there are various hypotheses regarding transmission dynamics and the lethality of SSWS under diverse physiochemical circumstances (Lowry et al. 2022). Stress and rapid degeneration ultimately result with symptomatic sea stars suffering from abnormally twisted arms, white lesions, loss of body tissue, arm loss, melting, and death.

SSWS reached pandemic levels from 2013–2017, killing an estimated 90 percent or more of the population (Lowry et al. 2022). Declines in the northern portion of its range were less pronounced than in the southern portion, but still exceeded 60 percent.

#### 4.1.3.2 Pile Driving Activities

Pile installation and removal will disturb bottom sediments and may cause a temporary increase in suspended sediment in the immediate area. We expect pile driving activities to produce total suspended sediment concentrations of approximately 5.0 to 10.0 mg/L above background levels

within approximately 91 m of the pile being driven (FHWA 2012). The resulting sediment plume is expected to settle out of the water column in a few hours or less. Studies of the effects of turbid water on fish suggest that concentrations of suspended sediment can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993). Invertebrate species, including the sunflower sea star, that live close to the shore are adapted to harsh conditions created by waves, tidal fluctuations, freshwater input, ice scour, and storm surge (Dunton et al. 2005, Dunton et al. 2012, Konar et al. 2019). The small spatial and temporal scale of substrate disturbance and increased turbidity is expected to have no effect on the sunflower sea star.

The Skagway Ore Terminal is a deep-water port that transitions sharply from a narrow nearshore area into deep marine waters with depths ranging from about 30 to 60 m. The redevelopment project will install 269 piles, which will remove approximately 15 $m^2$ of benthic habitat. The sunflower sea star is typically found in water less than 25 m deep and is assumed to occupy inter- and sub-tidal habitats throughout Southeast Alaska. Sunflower sea stars are solitary and do not typically aggregate. Post-pandemic densities are much less and range from 0 to 0.04 sea stars/$m^2$ (Traiger et al. 2022). Areas, such as western Prince William Sound, continue to have the highest densities. Sunflower sea stars could be in the shallower waters of the project site; however, given the low density of animals, deep water of the port, and small area of available habitat removed by pile installation, we determine that pile driving activities associated with the proposed action are not likely to adversely affect the sunflower sea star.

#### 4.1.3.3 Anthropogenic Noise

Overall, there are significant data gaps regarding the effects of anthropogenic noise on aquatic invertebrates, and currently it is almost impossible to come to clear conclusions on the nature and levels of man-made sound that have potential to cause effects upon these animals (Hawkins et al. 2015, Solé et al. 2023). Sound appears to be important for some invertebrate species; there is evidence that underwater sound is used by some pelagic larval invertebrates to orient themselves towards suitable settlement habitat, and some invertebrate species have been documented to show preference for habitats emanating specific frequency bands (Radford et al. 2010). Anthropogenic noise may potentially mask biologically important acoustic features of the soundscape for these species.

Exposure to continuous loud sound (>140 dB) can cause echinoderms, such as sea urchins, to have increased levels of stress-related hormones (Solé et al. 2023), but there is no data that the increase in these hormones affects their behavior or survival. Sunflower sea stars, like other members of the class Asteroidea, rely on chemosensation to detect and hunt prey, deter predators, form spawning aggregations, synchronize gamete release, and identify suitable habitat for larval settlement (Motti et al. 2018). There are no existing criteria to assess adverse impacts of anthropogenic sound on sunflower sea stars (Hawkins et al. 2015); however, noise is not expected to impact sunflower sea stars in any measurable way because their physiological and behavioral processes are mediated by chemical stimuli. Therefore, we conclude the effects of noise from vessel transit and pile driving activity on sunflower sea stars are insignificant.

## 4.2 Climate Change

One threat common to all the species we discuss in this opinion is global climate change. Because of this commonality, we present an overview here rather than in each of the species-specific narratives. A vast amount of literature is available on climate change and for more detailed information we refer the reader to these websites, which provide the latest data and links to the current state of knowledge on the topic.

https://www.ipcc.ch/reports/

https://climate.nasa.gov/evidence/

http://nsidc.org/arcticseaicenews/

https://arctic.noaa.gov/Report-Card

Increased air temperatures, increased ocean temperatures, and ocean acidification are the three facets of climate change presented here because they have the most direct impact on marine mammals and their prey.

*Air temperature*

Recording of global temperatures began in 1880, and the last nine years (2014–2022) have ranked as the nine warmest years on record. The yearly temperature for North America has increased at an average rate of 0.23°F since 1910; however, the average rate of increase has doubled since 1981 (0.49°F).[3]

The Arctic (latitudes between 60ºN and 90ºN) has been warming at more than two times the rate of lower latitudes since 2000. This is due to "Arctic amplification", a characteristic of the global climate system influenced by changes in sea ice extent, albedo, atmospheric and oceanic heat transports, cloud cover, black carbon, and many other factors (Serreze and Barry 2011, Richter-Menge et al. 2017, Richter-Menge 2019). The average annual temperature is now 3-4°F warmer than during the early and mid-century (Figure 7). The average annual temperature for Alaska in 2022 was 28.6°F, 2.6°F above the long-term average, ranking the 16th warmest in the 98-year record for the state.[4] Some of the most pronounced effects of climate change in Alaska include disappearing sea ice, shrinking glaciers, thawing permafrost, and changing ocean temperatures and chemistry (Chapin et al. 2014).

[3] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202213 accessed July 2023.
[4] https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/202213 accessed July 2023.

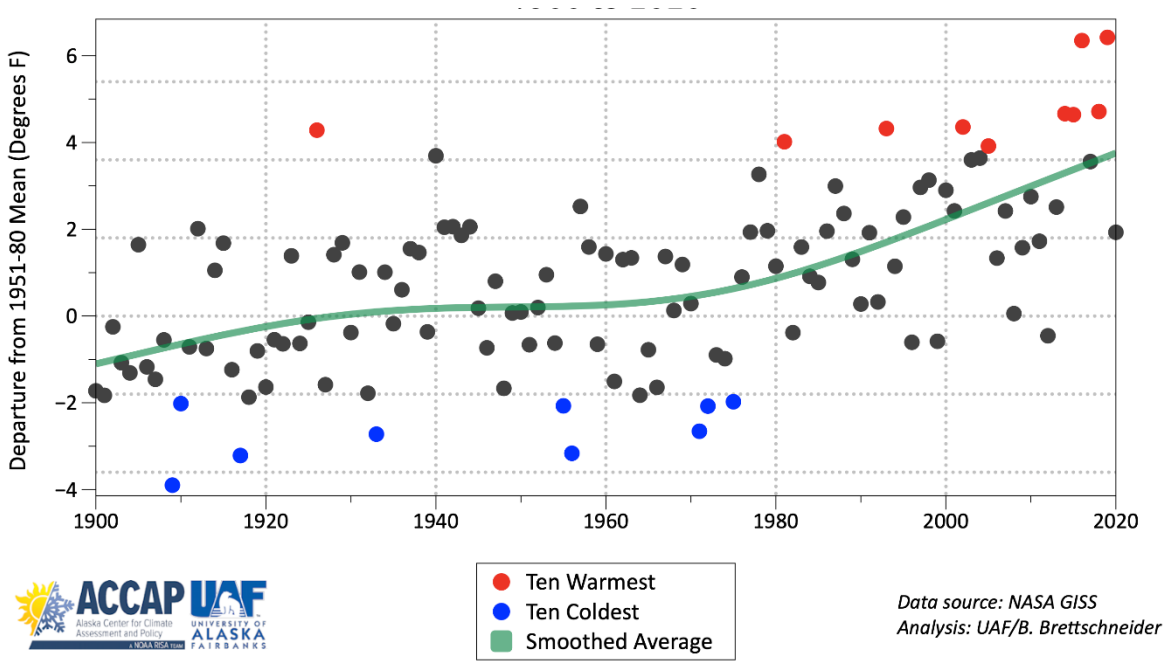



**Figure 7. Alaska Annual Average Temperature 1900 to 2020.**[5]

*Marine water temperature*

Higher air temperatures have led to higher ocean temperatures. More than 90 percent of the excess heat created by global climate change is stored in the world's oceans, causing increases in ocean temperature (IPCC 2019, Cheng et al. 2020). The four highest annual global ocean heat content (OHC) measurements, which is the amount of heat stored in the upper 2000 m (6,561 ft) of the ocean, have all occurred in the last four years (2019–2022), and regions of the North Pacific, North Atlantic, and Southern oceans, as well as the Mediterranean Sea, recorded their highest OHC since the 1950s.[6]

The seas surrounding Alaska have been unusually warm in recent years, with unprecedented warmth in some cases (Thoman and Walsh 2019). This effect is observed throughout the Alaska region, including the Bering, Chukchi, and Beaufort seas (Figure 8). Warmer ocean water affects sea ice formation and melt. In the first decade of the 21st century, Arctic sea ice thickness and annual minimum sea ice extent (i.e., September sea ice extent) began declining at an accelerated rate and continues to decline at a rate of approximately -2.7 percent per decade (Stroeve et al. 2007, Stroeve and Notz 2018).

[5] https://www.flickr.com/photos/iarcgroup/albums/72157709844958631 accessed July 2023.
[6] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202213 accessed July 2023.

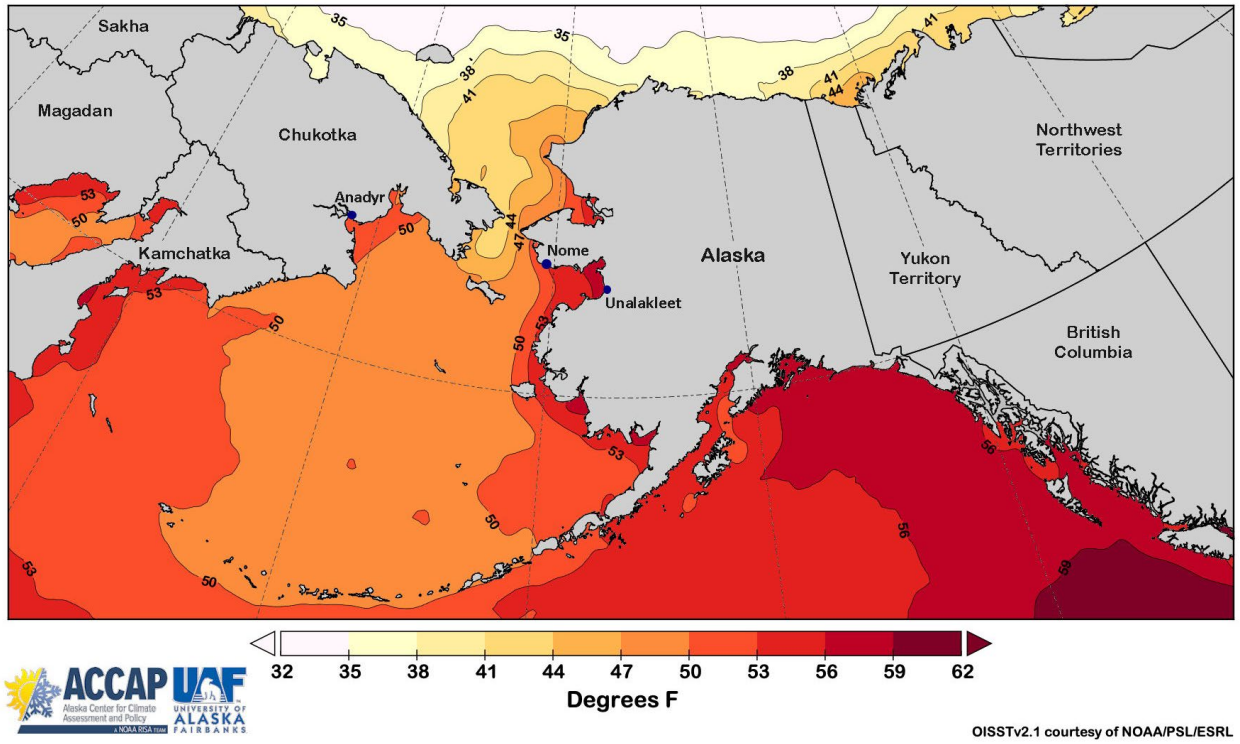



**Figure 8. Highest Average Sea Surface Temperature 1991-2020.**[7]

In the Pacific Arctic, with the reduction in the cold-water pool in the northern Bering Sea, large scale northward movements of commercial fish stocks are underway, as previously cold-dominated ecosystems warm (Grebmeier et al. 2006, Eisner et al. 2020). Plankton, crabs, and, ultimately, sessile invertebrates like clams are affected by these changes in water temperature (Grebmeier et al. 2006, Fedewa et al. 2020).

Another ocean water anomaly is the marine heat wave, a coherent area of extreme warm temperature at the sea surface that persists (Frölicher et al. 2018). Marine heatwaves are a key ecosystem driver and nearly 70 percent of global oceans experienced strong or severe heatwaves in 2016, compared to 30 percent in 2012 (Suryan et al. 2021). The largest recorded marine heat wave occurred in the northeast Pacific Ocean, appearing off the coast of Alaska in the winter of 2013-2014 and extending south to Baja California by the end of 2015 (Frölicher et al. 2018). The Pacific marine heatwave began to dissipate in mid-2016, but warming re-intensified in late-2018 and persisted into fall 2019 (Suryan et al. 2021). Consequences of this event included an unprecedented harmful algal bloom that extended from the Aleutian Islands to southern California, mass strandings of marine mammals, shifts in the distribution of invertebrates and fish, and shifts in abundance of several fish species (Cavole et al. 2016). Cetaceans, forage fish, Steller sea lions, adult cod, chinook and sockeye salmon in the Gulf of Alaska were all impacted by the Pacific marine heatwave (Bond et al. 2015, Peterson et al. 2016, Sweeney et al. 2018).

[7] https://www.flickr.com/photos/iarcgroup/51316771182/in/album-72157709845937092/ accessed July 2023.

The 2018 Pacific cod stock assessment estimated that the female spawning biomass of Pacific cod (an important prey species for Steller sea lions) was at its lowest point in the 41-year time series, following three years of poor recruitment and increased natural mortality as a result of the Pacific marine heatwave.[8] The spawning stock biomass dropped below 20 percent of the unfished spawning biomass in 2020; 20 percent is a minimum spawning stock size threshold instituted to help ensure adequate prey availability for the endangered Western DPS of Steller sea lions. The federal Pacific cod fishery in the Gulf of Alaska was closed by regulation to directed Pacific cod fishing in 2020 as a result (Barbeaux et al. 2020). As of 2022, Pacific cod has not recovered from the decline during the 2014-2016 marine heatwave.[9]

*Ocean Acidification*

For 650,000 years or more, the average global atmospheric carbon dioxide (CO2) concentration varied between 180 and 300 parts per million (ppm), but since the beginning of the industrial revolution in the late 1700s, atmospheric CO2 concentrations have been increasing rapidly, primarily due to anthropogenic inputs (Fabry et al. 2008, Lüthi et al. 2008). The world's oceans have absorbed approximately one-third of the anthropogenic CO2 released, which has buffered the increase in atmospheric CO2 concentrations (Feely et al. 2004, Feely et al. 2009). Despite the ocean's role as a large carbon sink, the CO2 level continues to rise and is currently at 419 ppm.[10]

As the oceans absorb CO2, the buffering capacity and pH of seawater is reduced. This process is referred to as ocean acidification. Ocean acidification reduces the saturation states of certain biologically important calcium carbonate minerals like aragonite and calcite that many organisms use to form and maintain shells (Bates et al. 2009, Reisdorph and Mathis 2014). When seawater is supersaturated with these minerals, calcification (growth) of shells is favored. Likewise, when the seawater becomes undersaturated, dissolution is favored (Feely et al. 2009).

High latitude oceans have naturally lower saturation states of calcium carbonate minerals than more temperate or tropical waters, making Alaska's oceans more susceptible to the effects of ocean acidification (Fabry et al. 2009, Jiang et al. 2015). Model projections indicated that aragonite undersaturation would start to occur by about 2020 in the Arctic Ocean and by 2050, all of the Arctic will be undersaturated with respect to aragonite (Feely et al. 2009, Qi et al. 2017). Large inputs of low-alkalinity freshwater from glacial runoff and melting sea ice contribute to the problem by reducing the buffering capacity of seawater to changes in pH (Reisdorph and Mathis 2014). As a result, seasonal undersaturation of aragonite was already detected in the Bering Sea at sampling stations near the outflows of the Yukon and Kuskokwim Rivers, and the Chukchi Sea (Fabry et al. 2009). Models and observations indicate that rapid sea ice loss will increase the uptake of CO2 and exacerbate the problem of aragonite undersaturation in the Arctic (Yamamoto et al. 2012, DeGrandpre et al. 2020).

Undersaturated waters are potentially highly corrosive to any calcifying organism, such as corals,

[8] https://www.fisheries.noaa.gov/alaska/population-assessments/2018-north-pacific-groundfish-stock-assessments accessed July 2023.
[9] https://apps-afsc.fisheries.noaa.gov/REFM/docs/2022/GOA-ESR-Brief.pdf accessed July 2023.
[10] https://gml.noaa.gov/ccgg/trends/ accessed July 2023.

bivalves, crustaceans, echinoderms and many forms of zooplankton such as copepods and pteropods, and, consequently, may affect Arctic food webs (Fabry et al. 2008, Bates et al. 2009). Pteropods, which are often considered indicator species for ecosystem health, are prey for many species of carnivorous zooplankton, fishes including salmon, mackerel, herring, and cod, and baleen whales (Orr et al. 2005). Because of their thin shells and dependence on aragonite, under increasingly acidic conditions, pteropods may not be able to grow and maintain shells (Lischka and Riebesell 2012). It is uncertain if these species, which play a large role in supporting many levels of the Alaskan marine food web, will be able to adapt to changing ocean conditions (Fabry et al. 2008, Lischka and Riebesell 2012).

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 (Hinzman et al. 2005, Burek et al. 2008, Doney et al. 2012, Huntington et al. 2020). The physical effects on the environment described above have impacted, are impacting, and will continue to impact marine species in a variety of ways (IPCC 2014), including shifting abundances, changes in distribution, changes in timing of migration, and changes in periodic life cycles of species. For example, cetaceans with restricted distributions linked to water temperature may be particularly susceptible to range restriction (Learmonth et al. 2006, Isaac 2009). Macleod (2009) estimated that, based on expected shifts in water temperature, 88 percent of cetaceans will be affected by climate change, 47 percent will be negatively affected, and 21 percent will be put at risk of extinction. Of greatest concern are cetaceans with ranges limited to non-tropical waters and preferences for shelf habitats (Macleod 2009).

## 4.3 Status of Listed Species and Critical Habitat Likely to be Adversely Affected by the Action

This opinion examines the status of each species and critical habitat that is likely to be adversely affected by the proposed action. Species status is determined by the level of extinction risk that the listed species faces, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR § 402.02. The opinion also examines the condition of critical habitat throughout the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

For each species, we present a summary of information on the population structure and distribution of the 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 an action's effects are likely to increase the species' probability of becoming extinct.

### 4.3.1 Mexico DPS Humpback Whales

Humpback whales are found in all oceans of the world with a broad geographical range from tropical to temperate waters in the Northern Hemisphere and from tropical to near-ice-edge

waters in the Southern Hemisphere. Additional information on humpback whale biology and natural history is available at:

https://www.fisheries.noaa.gov/species/humpback-whale

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

**Status and Population Structure**

In 1970, the humpback whale was listed under the Endangered Species Conservation Act (ESCA) as endangered worldwide (35 FR 18319; December 2, 1970), primarily due to overharvest by commercial whalers. Congress replaced the ESCA with the ESA in 1973 and humpback whales continued to be listed as endangered. Humpback whales are also considered "depleted" under the MMPA.

Following the cessation of commercial whaling, humpback whale numbers increased. NMFS conducted a global status review (Bettridge et al. 2015) and published a final rule recognizing 14 DPSs on September 8, 2016 (81 FR 62259). Four of these DPSs were designated as endangered and one as threatened, with the remaining nine not warranting ESA listing status.

Based on an analysis of migration between winter mating/calving areas and summer feeding areas using photo-identification, Wade (2021) concluded that whales feeding in Alaskan waters belong primarily to the Hawaii DPS (recovered), with small numbers from the WNP DPS (endangered) and Mexico DPS (threatened). There are approximately 1,084 animals in the WNP DPS and 2,913 animals in the Mexico DPS (Wade 2021). The population trend is unknown for both DPSs. The Hawaii DPS is estimated at 11,540 animals, and the annual growth rate is between 5.5 and 6.0 percent. Humpback whales in the Southeast Alaska summer feeding area are comprised of approximately 98 percent Hawaii DPS individuals and 2 percent Mexico DPS individuals. In the Gulf of Alaska approximately 89 percent of humpback whales belong to the Hawaii DPS, 11 percent belong to the Mexico DPS, and less than 1 percent belong to the WNP DPS.

**Distribution**

Humpback whales generally undertake seasonal migrations from their tropical calving and breeding grounds in winter to their high-latitude feeding grounds in summer, although some individuals may remain in Alaska waters year-round. Most humpbacks that summer in Alaska winter in temperate or tropical waters near Mexico, Hawaii, or in the western Pacific near Japan. In the spring, those animals migrate back to Alaska, where food is abundant. They tend to concentrate in several areas, including Southeast Alaska, Prince William Sound, Kodiak, the Bering Sea, and along the Aleutian Islands (Wild et al. 2023). Large numbers of humpbacks have also been reported in waters over the continental shelf, extending up to 100 nm offshore in the western Gulf of Alaska (Wade 2021).

**Presence in the Action Area**

*Marine Transit Routes*

The summer feeding range of humpback whales in the North Pacific includes waters of the Russian Far East, Beaufort Sea, Bering Sea, Chukchi Sea, Gulf of Alaska, Western Canada, and the U.S. West Coast (Young et al. 2022). Relatively high densities of humpback whales occur throughout much of Southeast Alaska and northern British Columbia. Southeast Alaska was identified as a biologically important area (BIA) for seasonal feeding due to the high density of animals from March-November (Ferguson et al. 2015). The second version of BIAs split the previous Southeast BIA with three seasonal occurrences into 10 BIAs and 2 Watch List areas, each with their own temporal delineation (Wild et al. 2023).

If project vessels deploy from Anchorage, the proposed vessel route is expected to transit through Mexico DPS critical habitat, the Kodiak BIA, and multiple Southeast BIAs. If vessels deploy from Juneau the proposed vessel route is expected to transit through multiple Southeast BIAs. Vessels deploying from Seattle will also transit through multiple Southeast BIAs (Figure 9).

*Taiya Inlet*

Humpback whales are present in Southeast Alaska all months of the year, and one or more Southeast BIAs is active between March and December. The closest BIA to the construction action area is located in the Southern Lynn Canal and Northern Chatham Strait, and is active from June through September (Wild et al. 2023).

Local observations indicate humpback whales occur in Taiya Inlet most commonly during the eulachon run in April and May (outside of the planned construction season) in relatively low numbers and for brief periods of time (NMFS 2019). Additionally, the probability of encountering a humpback whale from the Mexico DPS in Southeast Alaska is two percent (Wade 2021).

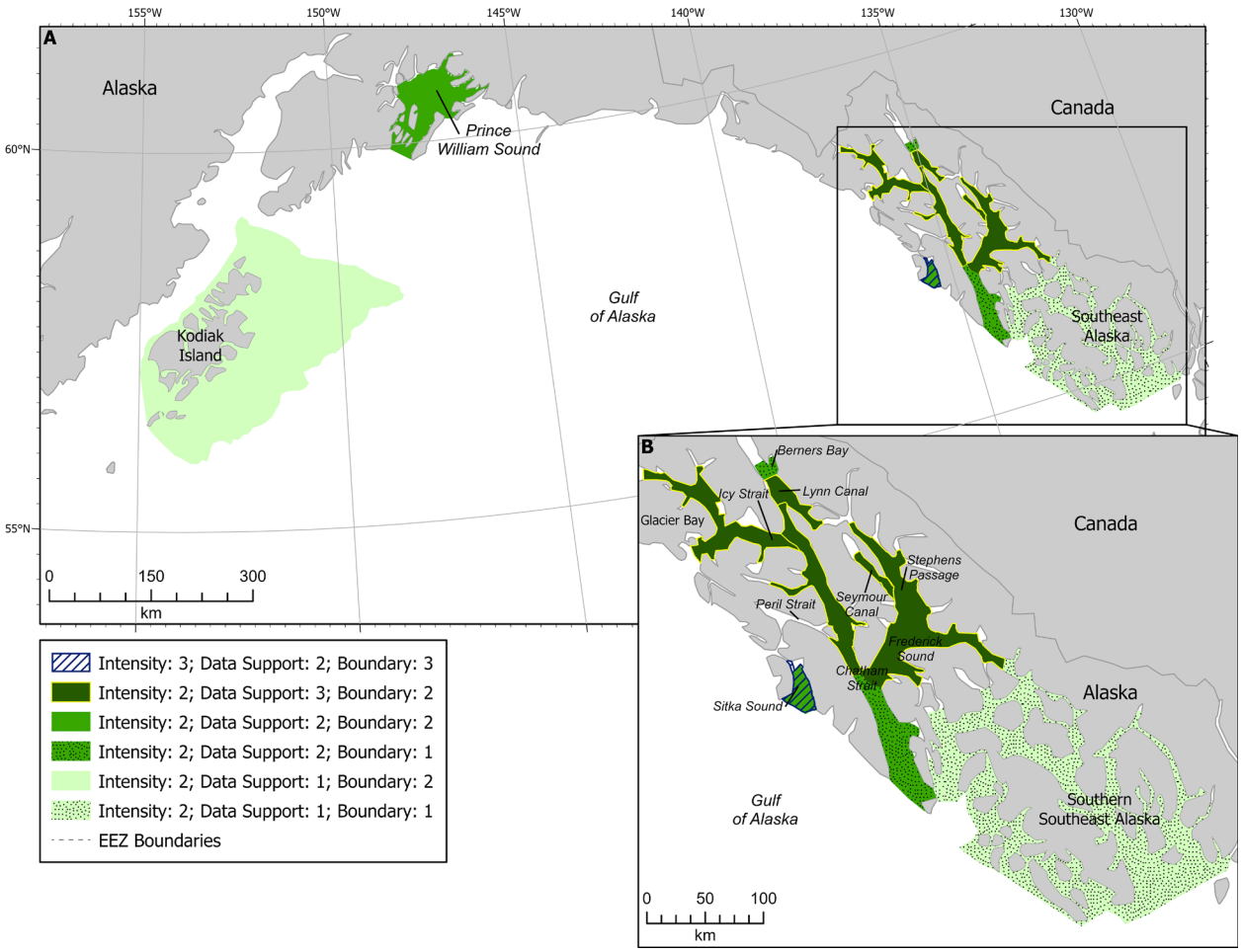



**Figure 9. Humpback Whale BIAs in the Gulf of Alaska and Southeast Alaska.**

## Foraging and Prey Selection

Humpback whales exhibit flexible feeding strategies, sometimes foraging alone and sometimes cooperatively (Clapham 1993). Humpback whales are 'gulp' or 'lunge' feeders, capturing large mouthfuls of prey during feeding rather than continuously filtering food, as may be observed in some other large baleen whales (Goldbogen et al. 2008, Simon et al. 2012). When lunge feeding, whales advance on prey with their mouths wide open, then close their mouths around the prey and trap them by forcing engulfed water out past the baleen plates.

Compared to some other baleen whales, humpbacks are relatively generalized in their prey selection. In the Northern Hemisphere, known prey includes euphausiids (krill), copepods, juvenile salmonids, herring, Arctic cod, walleye pollock, pteropods, and cephalopods (Johnson and Wolman 1984, Perry et al. 1999, Straley et al. 2018).

In the North Pacific, humpback whales forage in the coastal and inland waters along California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk (Tomilin 1967, Johnson and Wolman 1984).

## Reproduction

Humpbacks in the Northern Hemisphere give birth and presumably mate on low-latitude wintering grounds from January to March. Females attain sexual maturity at five years old 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 are probably weaned by the end of their first year (Perry et al. 1999).

## Hearing, Vocalization, and Other Sensory Capabilities

NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group, with a generalized hearing range between 7 Hz and 35 kHz (NMFS 2018b). 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 20-5,000 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 1986).

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

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

## Threats

*Natural Threats*

There is limited information on natural sources of injury or mortality to humpback whales. Based upon prevalence of tooth marks, attacks by killer whales appear to be highest among humpback whales migrating between Mexico and California, although populations throughout the Pacific Ocean appear to be targeted to some degree (Steiger et al. 2008). Juveniles appear to be the primary age group targeted.

Thirteen marine mammal species in Alaska were examined for domoic acid; humpback whales indicated a 38 percent prevalence (Lefebvre et al. 2016). Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales at 50 percent. The occurrence of the

nematode Crassicauda boopis appears to increase the potential for kidney failure in humpback whales and may be preventing some populations from recovering (Lambertsen 1992).

*Anthropogenic Threats*

Historically, commercial whaling represented the greatest threat to every population of humpback whale and was ultimately responsible for humpback whales being listed as an endangered species. In 1965, the International Whaling Commission banned commercial hunting of humpback whales in the Pacific Ocean, and, as a result, this threat has largely been curtailed. No commercial whaling occurs within the range of Mexico DPS humpbacks, and Alaskan subsistence hunters are not authorized to take humpback whales.

Vessel strike is one of the main threats and sources of anthropogenic impacts to humpback whales in Alaska. Neilson et al. (2012) summarized 108 ship strike events in Alaska from 1978 to 2011; 86 percent involved humpback whales. Eighteen humpbacks were struck by vessels between 2016 and 2020 (Freed et al. 2022). Most ship strikes of humpback whales are reported in Southeast Alaska (Helker et al. 2019), where high vessel traffic overlaps with whale presence.

Fishing gear entanglement is another major threat. Entanglement may result in only minor injury or may potentially significantly affect individual health, reproduction, or survival. Every year humpback whales are reported entangled in fishing gear in Alaska, particularly pot gear and gill net gear. Between 2016 and 2020, entanglement of humpback whales (n = 47) was the most frequent human-caused source of mortality and injury of large whales (Freed et al. 2022).

### 4.3.2 Western DPS Steller Sea Lions

**Status and Population Structure**

NMFS published a final rule listing Steller sea lions as threatened on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions as two DPSs (62 FR 24345; May 5, 1997); the Eastern DPS was listed as threatened and the Western DPS was listed as endangered. On November 4, 2013, the Eastern DPS was removed from the endangered species list (78 FR 66140). Information on Steller sea lion biology, threats, and habitat (including critical habitat) is available in the revised Steller Sea Lion Recovery Plan (NMFS 2008b) and 5-year Status Review (NMFS 2020).

The Western DPS of Steller sea lions decreased from an estimated 220,000 to 265,000 animals in the late 1970s to fewer than 50,000 in 2000 (Muto et al. 2021). Factors that may have contributed to this decline include incidental take in fisheries, competition with fisheries for prey, legal and illegal shooting, predation, exposure to contaminants, disease, and ocean regime shift-driven climate change (NMFS 2008b). The most recent comprehensive aerial photographic and land-based surveys of Western DPS Steller sea lions estimated a total Alaska population (both pups and non-pups) of 52,932 (Muto et al. 2021). There are strong regional differences in trends in abundance of Western DPS Steller sea lions, with mostly positive trends in the Gulf of Alaska and eastern Aleutian Islands and generally negative trends in the central and western Aleutian Islands.

Pup counts declined in the eastern and central Gulf of Alaska between 2015 and 2017, counter to the increases observed in both regions since 2002 (Sweeney et al. 2017). These declines may have been due to changes in prey availability from the marine heatwave that occurred in the northern Gulf of Alaska from 2014 to 2016 (Bond et al. 2015, Petersen et al. 2016, Muto et al. 2021). Pup counts rebounded to 2015 levels in 2019; however, non-pup counts in the eastern, central, and western Gulf of Alaska regions declined (Muto et al. 2021).

**Distribution**

Steller sea lions range along the North Pacific rim from northern Japan to California, with centers of abundance in the Gulf of Alaska and Aleutian Islands (Loughlin et al. 1984). Although Steller sea lions seasonally inhabit coastal waters of Japan in the winter, breeding rookeries outside of the U.S. are only located in Russia (Burkanov and Loughlin 2005). Steller sea lions are not known to migrate annually, but individuals may widely disperse outside of the breeding season (late May to early July; Jemison et al. 2013, Muto et al. 2021).

Land sites used by Steller sea lions are referred to as rookeries and haulouts (Figure 10). Rookeries are used by adult sea lions for pupping, nursing, and mating during the reproductive season. Haulouts are used by all age classes of both sexes but are generally not where sea lions reproduce. At the end of the reproductive season, some females may move with their pups to other haulout sites and males may migrate to distant foraging locations (Spalding 1964, Pitcher and Calkins 1981). Sea lions may make semi-permanent or permanent one-way movements from one site to another (Chumbley et al. 1997, Burkanov and Loughlin 2005). Round trip migrations of greater than 6,500 km by individual Steller sea lions have been documented (Jemison et al. 2013).

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

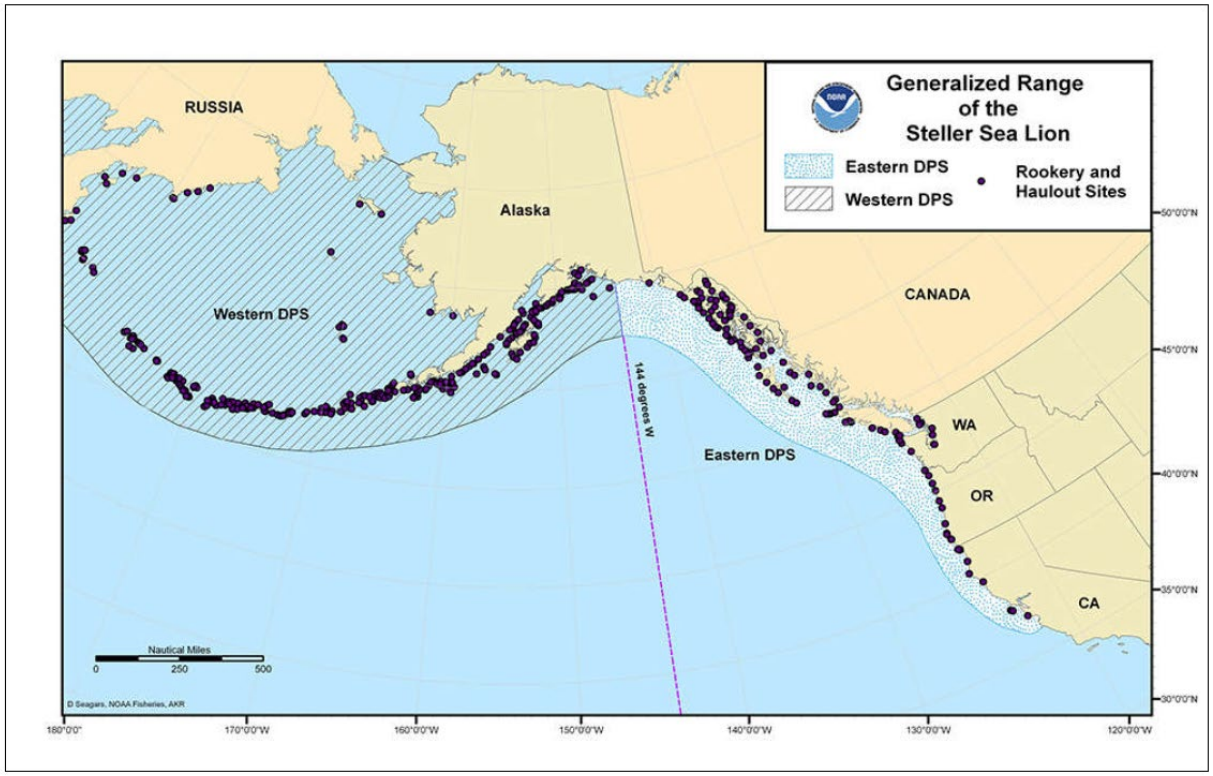



**Figure 10. Generalized Ranges of Western DPS and Eastern DPS Steller Sea Lions.**

## Presence in the Action Area

*Marine Transit Routes*

Given the wide dispersal of individuals, both the Western DPS and Eastern DPS of Steller sea lions will likely be encountered along the transit routes. An area of high occurrence extends from the shore to water depths of 500 m. In the Gulf of Alaska, foraging habitat is primarily shallow, nearshore, and continental shelf waters 8 to 24 km offshore with a secondary occurrence inshore of the 1,000 m isobath, and a rare occurrence seaward of the 1,000 m isobath.

If project vessels deploy from Anchorage, the proposed vessel route is expected to transit through Steller sea lion critical habitat at the mouth of Cook Inlet. If vessels deploy from Juneau, the proposed vessel route is expected to transit in proximity to Steller sea lion critical habitat in Southeast Alaska. Vessels deploying from Seattle will also transit in proximity to Steller sea lion critical habitat in Southeast Alaska.

*Taiya Inlet*

The construction action area and surrounding waters contain abundant sources of prey species in which Steller sea lions forage year-round. Lutak Inlet, located southwest of the project site, attracts high numbers of Steller sea lions during the spring eulachon spawning (Womble et al.

2005). There are two known Steller sea lion haulouts in the vicinity of the construction action area. Taiya Point is located approximately 18 km south of the construction site and is a temporary haulout used during the Lutak Inlet eulachon run. Gran Point is located approximately 36 km downstream in Lynn Canal and is a major haulout that has been designated as critical habitat.

Steller sea lions in the construction action area are expected to be predominantly from the Eastern DPS. Studies have confirmed movement of animals across the 144° W longitude boundary (Raum-Suryan et al. 2002, Pitcher et al. 2007, Fritz et al. 2013, Jemison et al. 2013), and branded Western DPS Steller sea lions have been detected in northern Lynn Canal near Taiya Inlet. Of the Steller sea lion nonpups (1+ years old) in Lynn Canal, an estimated 1.4 percent belong to the Western DPS (Hastings et al. 2020).

**Feeding, Diving, Hauling out, and Social Behavior**

The foraging strategy of Steller sea lions is strongly influenced by seasonality of sea lion reproductive activities on rookeries and the seasonal presence of many prey species. Steller sea lions are generalist predators that eat a variety of fishes and cephalopods (Pitcher and Calkins 1981, Calkins and Goodwin 1988, NMFS 2008b), and occasionally other marine mammals and birds (Pitcher and Fay 1982, NMFS 2008b).

During summer, Steller sea lions feed mostly over the continental shelf and shelf edge. Females attending pups forage within 20 nm of breeding rookeries (Merrick and Loughlin 1997), which is the basis for designated critical habitat around rookeries and major haulout sites.

Steller sea lions tend to make shallow dives of less than 250 m, but are capable of deeper dives (NMFS 2008b). Female foraging trips during winter tend to be longer in duration, farther from shore, and with deeper dives. Summer foraging dives, on the other hand, tend to be closer to shore and are shallower (Merrick and Loughlin 1997). Adult females begin a regular routine of alternating foraging trips at sea with nursing their pups on land a few days after birth.

Steller sea lions are gregarious and often travel in large groups of up to 45 individuals (Keple 2002), and rafts of several hundred animals are often seen adjacent to haulouts. Individual rookeries and haulouts may be comprised of hundreds of sea lions. At sea, groups usually consist of females and subadult males, as adult males are usually solitary (Loughlin 2002).

**Hearing, Vocalizations, and Other Sensory Capabilities**

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group, with an applied frequency range between 60 Hz and 39 kHz in water (NMFS 2018b). Studies of Steller sea lion auditory sensitivities have found that this species detects sounds underwater between 1 and 25 kHz (Kastelein et al. 2005), and in air between 250 Hz and 30 kHz (Mulsow and Reichmuth 2010). Sound signals from vessels are typically within the hearing range of Steller sea lions, whether the animals are in the water or hauled out.

## Threats

*Natural Threats*

Killer whale predation on the Western DPS, under reduced population size, may cause significant reductions in the stock (NMFS 2008b). Steller sea lions are also vulnerable to predation from sleeper sharks. Juvenile Steller sea lions were found to underutilize foraging habitats and prey resources based on predation risk by killer whales and sleeper sharks (Frid et al. 2009).

Steller sea lions have tested positive for several pathogens, and parasites are common; however, disease levels and mortality resulting from infestation are unknown. Significant negative effects of these factors may occur in combination with stress, which may compromise the immune system. If other factors, such as disturbance, injury, or difficulty feeding occur, it is more likely that disease and parasitism can play a greater role in population reduction.

*Anthropogenic Threats*

Subsistence hunters removed 209 Western DPS Steller sea lions between 2014 and 2018 in controlled and authorized harvests (Muto et al. 2021). Between 2016 and 2020, human-caused mortality and injury of the Western DPS Steller sea lions (n = 148) was primarily caused by entanglement in fishing gear, in particular, commercial trawl gear (n=113; Freed et al. 2022).

Concern also exists regarding competition between commercial fisheries and Steller sea lions for the same resource: stocks of pollock, Pacific cod, and Atka mackerel. Limitations on fishing grounds, duration of fishing season, and monitoring have been established to prevent Steller sea lion nutritional deficiencies as a result of inadequate prey availability.

Metal and contaminant exposure remains a focus of ongoing investigation. Total mercury concentrations measured in hair samples collected from pups in the western-central Aleutian Islands were detected at levels that cause neurological and reproductive effects in other species (Rea et al. 2013).

# 5 ENVIRONMENTAL BASELINE

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action areas that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR § 402.02).

Focusing on the impacts of activities specifically within the action area allows us to assess the prior experience and condition of the animals that will be exposed to effects from the actions under consultation. This focus is important because individuals of ESA-listed species may commonly exhibit, or be more susceptible to, adverse responses to stressors in some life history states, stages, or areas within their distributions than in others. These localized stress responses or baseline stress conditions may increase the severity of the adverse effects expected from proposed actions.

## 5.1 Recent Biological Opinions in the Action Area

NMFS AKR has issued one biological opinion and a number of letters of concurrence for construction projects in Taiya Inlet in recent years. The biological opinion was issued in 2019 to the USACE and NMFS PR1 for the installation of two mooring dolphins at the Railroad Dock in Skagway, Alaska.

This biological opinion is available on the NMFS Alaska Region website at: https://www.fisheries.noaa.gov/alaska/consultations/section-7-biological-opinions-issued-alaska-region

## 5.2 Marine Vessel Activity

The Skagway Ore Basin is an industrial waterway located within Taiya Inlet at the western edge of the Municipality of Skagway. The Ore Terminal, located along the northern end of the Ore Basin, is a deep-water port that transitions sharply from a narrow nearshore area into deep marine waters of Lynn Canal. Skagway is the northernmost city in the Southeast Alaska region, and it provides the nearest access to tidewater for much of the neighboring Yukon Territory, Canada.

Year-round marine traffic includes daily passenger ferries, weekly cargo barges with occasional special deliveries, fuel delivery barges every three weeks, and bulk ore vessels approximately four times a year, depending on mining operations. From April to October, cruise ships make a port of call almost daily. The number of cruise ship calls ranged between 380 and 446 per year

from 2013 to 2019. In 2022, 475 cruise ships carrying approximately 1.2 million passengers were scheduled to visit Skagway, and 500 cruise ships are scheduled to visit in 2023.[11]

Vessel noise and presence can impact whales by causing behavioral disturbances, auditory interference, or non-auditory physical and physiological effects (e.g., vessel strike). From 1978 to 2011, there were 108 recorded whale-vessel collisions in Alaska, with the majority occurring in Southeast Alaska between May and September (Neilson et al. 2012). Small recreational vessels traveling at speeds over 13 knots were most commonly involved in ship strike encounters; however, all types and sizes of vessels were reported (Neilson et al. 2012). The majority of vessel strikes involved humpback whales (86 percent) and the number of humpback strikes increased annually by 5.8 percent from 1978 to 2011. Seventeen humpback whales were reported struck by vessels between 2013 and 2015 (Delean et al. 2020) and 18 humpbacks were reported struck by vessels between 2016 and 2020 (Freed et al. 2022). There have been 72 reported ship strikes in Southeast Alaska between 2000 and 2021, 8 of which were in Lynn Canal and at least 80 km south of the action area (NMFS Alaska Regional Office Stranding Database accessed April 2023).

NMFS implemented regulations to minimize harmful interactions between ships and humpback whales in Alaska (see 50 CFR §§ 216.18, 223.214, and 224.103(b)). Additionally, NMFS and the National Park Service started the Whale Alert Alaska program in Southeast Alaska. Users, including cruise ships, Alaska Marine Highway ferries, and U.S. Coast Guard vessels, report sightings information, which is shared with other active program users to reduce the risk of ship strike. The Whale SENSE program (https://whalesense.org/) is another voluntary program in Southeast Alaska. Many of the whale watching tour companies in the area participate, and commit to responsible practices.

Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated, e.g., near rookeries or haulouts (NMFS 2008b). There are four records of stranded Steller sea lions with injuries indicative of vessel strike in Alaska, three occurred in Sitka and one in Kachemak Bay (NMFS Alaska Regional Office Stranding Database accessed April 2023). The risk of vessel strike, however, has not been identified as a significant concern for Steller sea lions.

The project area is subject to noise from anthropogenic sources, including marine vessels, shoreline construction, and land-based vehicles. Shoreline land use near the project is dominated by development associated with the community of Skagway, while the surrounding area is primarily forested hillsides. Regular vessel traffic within Taiya Inlet contributes to the baseline noise levels in the action area.

Free-ranging marine mammals may engage in avoidance behavior when surface vessels move toward them, similar to their behavioral responses to predators. Animals have been observed reducing their visibility at the water's surface and moving horizontally away from the source of disturbance or adopting erratic swimming strategies (Williams et al. 2002, Lusseau 2003, 2006). Studies indicate that dive times and swimming speeds increase, vocalizations and jumping

[11] https://claalaska.com/wp-content/uploads/2023/06/SKG-Skagway-2023.pdf accessed July 2023.

usually decrease, and individuals in groups move closer together (Kruse 1991, Evans et al. 1994). Most animals in confined spaces, such as shallow bays, moved towards more open, deeper waters when vessels approached (Kruse 1991).

Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects from anthropogenic sounds such as shipping traffic. Baleen whales may also exhibit behavioral changes in response to vessel noise. Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, suggesting an energetic cost to the affected animal. Humpback cow-calf pairs significantly reduced the amount of time spent resting and milling when vessels approached, as compared to undisturbed whales (Morete et al. 2007). Responding to vessels is likely stressful to humpback whales, but the biological significance of that stress is unknown (Bauer and Herman 1986).

Potential impacts of vessel disturbance on Steller sea lions have not been well studied, and the responses likely depend on the season and stage in the reproductive cycle (NMFS 2008b). Steller sea lions are more likely to be disturbed at haulouts and near rookeries, where in-air vessel noise could cause behavioral responses such as avoidance of the sound source, spatial displacement from the immediate surrounding area, trampling, and abandonment of pups (Calkins and Pitcher 1982, Kucey 2005). Repeated disturbances that result in abandonment or reduced use of rookeries by lactating females could negatively affect body condition and survival of pups through interruption of normal nursing cycles (NMFS 2008b). Increases in ambient noise from vessel traffic, however temporary, also have the potential to mask communication between sea lions and affect their ability to detect predators (Richardson and Malme 1993, Weilgart 2007).

## 5.3 Fisheries Interactions Including Entanglement

Commercial, recreational, and subsistence fishing occurs in the Southeast Alaska region. Subsistence fisheries include salmon, halibut, herring spawn-on-kelp, shellfish, and groundfish. Eulachon, Dolly Varden, trout, and smelt are also taken for subsistence purposes. Sport fishers have year-round opportunities to catch all five species of Pacific salmon, halibut, lingcod, and rockfish; good king salmon trolling in Taiya Inlet occurs June through August. Salmon, herring, groundfish, and shellfish species are all commercially fished in the area.

Commercial fisheries pose a threat to marine mammal stocks. Entanglement may result in minor injury or may potentially significantly affect individual health, reproduction, or survival. Additionally, reductions in seasonal availability and distribution of fish can cause cumulative effects on many species that depend on reliable sources of prey for survival.

Bettridge et al. (2015) report that fishing gear entanglements may moderately reduce the population size or the growth rate of ESA-listed whales. Humpback whales have been killed and injured during interactions with commercial fishing gear; however, the frequency of these interactions does not appear to have a significant adverse consequence for humpback whale populations. Most entanglements occur between early June and early September, when humpbacks are foraging in nearshore Alaska waters. A photographic study of humpback whales in southeastern Alaska found at least 53 percent of individuals showed some kind of scarring

from fishing gear entanglement (Neilson et al. 2005). Between 2016 and 2020, entanglement of humpback whales (n = 47) was the most frequent human-caused source of mortality and injury of large whales (Freed et al. 2022).

Among Western DPS Steller sea lions, the minimum estimated mean annual mortality and serious injury rate in U.S. commercial fisheries between 2014 and 2018 was 37 individuals (Muto et al. 2021). This is likely an underestimate as it is an actual count of verified human-caused deaths and serious injuries; not all entangled animals strand nor are all stranded animals found, reported, or have the cause of death determined. Between 2016 and 2020 human-caused mortality and injury of the Western DPS Steller sea lions (n = 148) was primarily caused by entanglement in fishing gear, in particular, commercial trawl gear (n=113; Freed et al. 2022).

Commercial fisheries may indirectly affect marine mammals by reducing the amount of available prey or affecting prey species composition. Competition could exist between listed species and commercial fishing for prey species, as certain fisheries target key Steller sea lion and humpback whale prey, including Pacific cod, salmon, and herring. Fishery management measures have reduced this potential competition in some regions (e.g., no trawl zones and gear restrictions on various fisheries in southeast Alaska). The broad distribution of prey and seasonal fisheries that differ from listed species presence in the area may minimize competition as well.

## 5.4 Pollutants and Discharges

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

In offshore waters, the most likely sources of pollution and contaminants are ballast water discharge and accidental spills of oil, fuel, and other materials from traversing vessels. Ships can potentially release pollutants and non-indigenous organisms through the discharge of ballast water. Marine organisms picked up in ship ballast water and released into non-native habitats are responsible for significant ecological and economic perturbations costing billions of dollars; this is a recognized worldwide problem. Discharges of wastes from vessels are regulated by the United States Coast Guard and, by law, no discharges of any kind are allowed within three miles of land. The Alaska Department of Fish and Game (ADFG) developed an Aquatic Nuisance Species Management Plan (Fay 2002) in order to protect Alaska's waters. The effects of discharged ballast water and the possible introduction of invasive species on humpback whales and Steller sea lions are unknown.

Increased vessel activity in the action area during construction will temporarily increase the risk of accidental fuel and lubricant spills. Accidental spills may occur from a vessel leak or if the vessel runs aground. From 1995 to 2012, approximately 400 spills (100 to 300,000 gallons) occurred in Alaska's marine waters. Most were in nearshore and shallow coastal waters and were primarily diesel (BLM 2019). Small spills combined with the dispersive action of waves and currents likely reduces the probability of an encounter and adverse reaction of a listed species to extremely low levels.

## 5.5 Climate and Environmental Change

Since the 1950s the atmosphere and oceans have warmed, snow and sea ice have diminished, sea levels have risen, and concentrations of greenhouse gases have increased (IPCC 2014). There is little doubt that human influence has been the dominant cause of the observed warming since the mid-20th century (IPCC 2014). The impacts of climate change are especially pronounced at high latitudes and in polar regions. Average temperatures have increased across Alaska at more than twice the rate of the rest of the United States.[12]

In the past 60 years, average air temperatures across Alaska have increased by approximately 3°F, and winter temperatures have increased by 6°F (Chapin et al. 2014). Some of the most pronounced effects of climate change in Alaska include disappearing sea ice, shrinking glaciers, thawing permafrost, and changing ocean temperatures and chemistry (Chapin et al. 2014). 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 et al. 2001). The impacts of these changes and their interactions on listed species in Alaska are hard to predict.

Indirect threats associated with climate change include increased human activity as a result of regional warming. Less ice could mean increased vessel activity or construction activities with an associated increase in sound, pollution, and risk of ship strike. Human fishing pressure could change the abundance, seasonality, or composition of prey species. Fisheries in Alaska are managed with the goal of sustainability; however, not all fish stocks are assessed, and it is unknown whether management of fisheries for optimal returns provides sufficient densities in feeding areas for efficient foraging by ESA-listed marine mammal species.

An unusual mortality event (UME) of large cetaceans occurred in Alaskan waters in 2015-2016. Reports of dead whales included 22 humpback, 12 fin, 2 gray, 1 sperm, and 6 unidentified whales. The strandings were concurrent with the arrival of the Pacific marine heatwave, one of the strongest El Nino weather patterns on record, decreasing ice extent in the Bering Sea, and one of the warmest years on record in Alaska in terms of air temperature.

Recent studies and observations have shown changes in distribution (Brower et al. 2018), body condition (Neilson and Gabriele 2020), and migratory patterns of humpback whales, likely in response to climate change. The indirect effects of climate change on Mexico DPS humpback whales over time would likely include changes in the distribution of ocean temperatures suitable for many stages of their life history, the distribution and abundance of prey, and the distribution and abundance of competitors or predators.

The Pacific marine heatwave is also likely responsible for poor growth and survival of Pacific cod, an important prey species for Steller sea lions. The 2018 Pacific cod stock assessment estimated that the female spawning biomass was at its lowest point in the 41-year time series. This assessment was conducted following three years of poor recruitment and increased natural

[12] https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-alaska_.html accessed April 2023.

mortality during the Gulf of Alaska marine heat wave from 2014 to 2016 (NMFS 2018a).

The Steller Sea Lion Recovery Plan ranks environmental variability as a potentially high threat to recovery of the Western DPS (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. 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 2008b). 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).

## 5.6 Environmental Baseline Summary

The Environmental Baseline describes several activities and factors that have adversely affected the ESA-listed species that occur in the action area:

- Vessel traffic in the action area poses varying levels of threat to the listed species, depending on the type and intensity of the shipping activity and its degree of spatial and temporal overlap with habitats. Vessel types involved in whale strikes have included cruise ships, recreational vessels, and fishing vessels. The presence, movements, and sound of ships in the vicinity of some species may cause them to abandon breeding or foraging areas.
- Humpback whales and Steller sea lions have been impacted by entanglement.
- Increased vessel activity during construction will temporarily increase the risk of accidental spills.
- There are insufficient data to make reliable estimations of the impact of climate change on marine mammals considered in this opinion. The feeding range of humpback whales is larger than that of other species and consequently, as feeding generalists, it is likely that these whales may be more resilient to climate change than other species with more restricted foraging habits. Although the effects of climate change and other large-scale environmental phenomena on Steller sea lion habitat cannot be predicted with certainty, impacts to their prey from oceanic regime shifts, or changes in freshwater habitat (hydrologic changes, increased water temperature) are projected to occur.

Mexico DPS humpback whales and Western DPS Steller sea lions in the area appear to be increasing in population size – or, at least, their population sizes do not appear to be declining – despite their continued exposure to the direct and indirect effects of the activities discussed in the Environmental Baseline.

# 6 EFFECTS OF THE ACTION

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

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.

NMFS identified and addressed all potential stressors, and considered all consequences of the proposed action, individually and cumulatively, in developing the analysis and conclusions in this opinion regarding the effects of the proposed action on ESA-listed species and designated critical habitat.

## 6.1 Project Stressors

Stressors are any physical, chemical or biological phenomena that can induce an adverse response. The effects section starts with identification of the stressors produced by the constituent parts of the proposed action. Based on our review of the data available, the proposed activities may cause these stressors:

- Acoustic disturbance from pile driving activities
- Vessel noise, presence, and strikes
- Sea floor disturbance and turbidity
- Effects on prey
- Trash and debris
- Pollutants and contaminants

### 6.1.1 Minor Stressors on ESA-Listed Species and Critical Habitat

Based on a review of available information, we determined the following stressors are either unlikely to occur or likely to have minimal impacts on Mexico DPS humpback whales and Western DPS Steller sea lions.

#### 6.1.1.1 Vessel Noise, Presence, and Strikes

Vessel traffic in Taiya Inlet could potentially increase slightly upon completion of the Ore Terminal redevelopment project; however, this is not expected. The new structures of the proposed project will provide safe mooring and industrial operations with a modern facility. Skagway's waterfront operational efficiency will be improved, providing a better separation between the industrial and tourist parts of the port, and cruise ship passenger movements will also be improved.

Project vessels are likely to generate underwater sound levels exceeding the non-impulsive threshold of 120 dB, and disturbance to listed species could occur from project vessel noise. Although some marine mammals could receive sound levels exceeding the acoustic threshold of 120 dB from the project vessels, disturbances rising to the level of harassment are extremely unlikely to occur. The nature of the exposure will be low-frequency, with much of the acoustic energy emitted by project vessels at frequencies below the best hearing ranges of listed marine mammals in the action area. In addition, the duration of the exposure to noise from transiting vessels will be temporary and brief.

The project vessels will emit continuous sound while in transit, which will alert marine mammals before the received sound level exceeds 120 dB and a startle response is not expected. Slight deflection and avoidance are expected to be common responses, in those instances where there is any response at all. Free-ranging marine mammals may engage in avoidance behavior when surface vessels move toward them, similar to their behavioral responses to predators. Animals have been observed reducing their visibility at the water surface and moving horizontally away from the source of disturbance or adopting erratic swimming strategies (Williams et al. 2002, Lusseau 2003, 2006). Studies indicate that dive times and swimming speeds increase, vocalizations and surface active behaviors usually decrease, and individuals in groups move closer together (Kruse 1991, Evans et al. 1994). Most animals in confined spaces, such as shallow bays, moved towards more open, deeper waters when vessels approached (Kruse 1991).

Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects from anthropogenic sounds such as shipping traffic. Baleen whales may also exhibit behavioral changes in response to vessel noise. Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, suggesting an energetic cost to the affected animal. Humpback cow-calf pairs significantly reduced the amount of time spent resting and milling when vessels approached, as compared to undisturbed whales (Morete et al. 2007). Responding to vessels is likely stressful to humpback whales, but the biological significance of that stress is unknown (Bauer and Herman 1986).

Potential impacts of vessel disturbance on Steller sea lions have not been well studied, and the responses will likely depend on the season and stage in the reproductive cycle (NMFS 2008b). Steller sea lions are more likely to be disturbed at haulouts and near rookeries, where in-air vessel noise or visual presence could cause behavioral responses such as avoidance of the sound source, spatial displacement from the immediate surrounding area, trampling, and abandonment of pups (Calkins and Pitcher 1982, Kucey 2005). Repeated disturbances that result in abandonment or reduced use of rookeries by lactating females could negatively affect body condition and survival of pups through interruption of normal nursing cycles (NMFS 2008b). Increases in ambient noise from vessel traffic, however temporary, also have the potential to mask communication between sea lions and affect their ability to detect predators (Richardson and Malme 1993, Weilgart 2007).

Marine mammals that frequent the project area are very likely familiar with vessel noise due to the common presence of ferries, cruise ships, tug and barges, and other commercial and recreational vessels that use the Port of Skagway. If animals do respond to project vessel noise, they may exhibit slight deflection from the source, engage in low-level avoidance behavior or short-term vigilance behavior. However, these behaviors are not likely to result in adverse consequences for the animals. The nature and duration of response is not expected to disrupt, to a measurable degree, important behavioral patterns such as feeding or resting.

Some marine mammals will likely be exposed to vessel noise as a result of this action. If exposure occurs, it will be temporary and localized, and likely cause responses that are at a low energy cost to individuals. The proposed mitigation measures are expected to further reduce the number of times marine mammals react to project vessels. NMFS concludes that any disturbance of marine mammals from vessel noise will be temporary and the effects to listed species from vessel noise will be extremely small.

Ship strikes can cause major wounds or death to marine mammals. An animal at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or a vessel propeller could injure or kill an animal below the water surface. From 1978-2011, there were 108 recorded whale-vessel collisions in Alaska, with the majority occurring in Southeast Alaska between May and September (Neilson et al. 2012). Small recreational vessels traveling at speeds over 13 knots were most commonly involved in ship strike encounters; however, all types and sizes of vessels were reported (Neilson et al. 2012). The majority of vessel strikes involved humpback whales (86 percent), and the number of humpback strikes increased by 5.8 percent annually from 1978 to 2011. Seventeen humpback whales were reported struck by vessels between 2013 and 2015 (Delean et al. 2020), and 18 humpbacks were reported struck by vessels between 2016 and 2020 (Freed et al. 2022) in Alaskan waters. The closest reported strike to the project site is over 50 km downstream, where data indicate a whale-vessel collision hotspot in the waters of southern Lynn Canal, Favorite Channel, and Saginaw Channel (Neilson et al. 2012, NMFS Alaska Regional Office Stranding Database accessed July 2023). The probability of encountering a humpback whale from the Mexico DPS in Southeast Alaska is 2 percent and eleven percent in the Gulf of Alaska (Wade 2021).

There are only four records of stranded Steller sea lions with injuries indicative of vessel strike in Alaska, and none of them are near Taiya Inlet; three occurred in Sitka and one in Kachemak Bay

(NMFS Alaska Regional Office Stranding Database accessed July 2023). Steller sea lions are likely more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated, e.g., near rookeries or haulouts (NMFS 2008b). The risk of vessel strike, however, has not been identified as a significant concern for Steller sea lions.

There may be an increased risk of vessel strike due to the increased traffic associated with the redevelopment of the Ore Terminal. However, the low number of vessel trips, transitory nature of project-related vessel traffic, slow speeds, and implementation of mitigation measures limit the risk of strike from the proposed action. NMFS concludes that the likelihood of vessel strike of Mexico DPS humpback whales or Western DPS Steller sea lions is considered to be improbable.

#### 6.1.1.2 Sea Floor Disturbance and Turbidity

The proposed activities would not result in permanent impacts to habitats used directly by marine mammals except for the actual footprint of the redeveloped Ore Terminal. The total seafloor area likely impacted by the project is relatively small compared to the available habitat in Southeast Alaska and does not include any biologically important areas or other habitat of known importance. The area is highly influenced by anthropogenic activities and is not heavily used by listed species, especially during the planned work window of October to March. Additionally, the total seafloor area affected by pile installation and removal is a small area compared to the vast foraging habitat available to marine mammals. At best, the construction area provides marginal foraging habitat for marine mammals and fishes. Furthermore, pile driving at the project site would not obstruct movements or migration of marine mammals.

Pile driving may cause temporary and localized turbidity through sediment disturbance. Increases in turbidity levels will have temporary impacts on water quality, and the MOS will comply with state water quality standards during construction. Turbidity plumes during pile installation and removal will be localized around the pile; turbidity associated with pile installation is localized to an approximate 7.6 m radius around the pile (Everitt et al. 1980). Shutdown mitigation measures are likely to prevent listed cetaceans from being close enough to experience effects of turbidity from pile driving, and pinnipeds could avoid localized areas of turbidity.

Due to the temporary, localized, and low levels of turbidity increases, it is not expected that turbidity would result in immediate or long-term effects to Mexico DPS humpback whales and Western DPS Steller sea lions.

#### 6.1.1.3 Effects on Prey

Construction activities will produce non-impulsive (i.e., vibratory pile installation and removal) and impulsive (i.e., impact pile driving) sounds. Fish react to intermittent low-frequency sounds and sounds that are especially strong. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid areas with certain types of sound energy.

Impulsive sounds at received levels of 160 dB may cause subtle changes in fish behavior and SPLs of 180 dB may cause noticeable changes in behavior (Pearson et al. 1992, Skalski et al. 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality (Popper et al. 2014a, Popper et al. 2014b). Pile driving associated barotrauma (i.e., damage to internal tissues) of fish has been found to occur at sound pressure levels of 205-215 dB re: 1 $\mu Pa_{peak}$ in experimental studies (Casper et al. 2012, Halvorsen et al. 2012). However, there are very few experimental examples of sound being sufficiently loud to result in death or mortal injury to fishes (Popper and Hawkins 2019).

Injury to fish depends more on the magnitude of particle motion than on sound levels as mammals perceive it (Popper and Hawkins 2019). It is likely that fish will avoid sound sources within ranges that may be harmful (McCauley et al. 2003). The most likely impact to fish from pile driving activities would be temporary behavioral avoidance of the project area. The duration of fish avoidance of this area after pile driving ceases is unknown, but a rapid return to normal recruitment, distribution, and behavior is expected.

In general, impacts to marine mammal prey species are expected to be minor and temporary, given the small area of pile driving relative to known feeding areas of listed marine mammals. We expect fish will be capable of moving away from project activities to avoid exposure to noise. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. We expect the area in which stress, injury, TTS, or changes in balance of prey species may occur will be limited to a few meters directly around the pile driving operations.

Studies on euphausiids and copepods, two of the more abundant and biologically important groups of zooplankton, have documented some sensitivity to sound (Chu et al. 1996, Wiese 1996); however, any effects of pile driving activities on zooplankton would be expected to be restricted to the area within a few meters of the project and would likely be sub-lethal. No appreciable adverse impact on zooplankton populations will occur due in part to large reproductive capacities and naturally high levels of predation and mortality of these populations. Any mortality or impacts on zooplankton as a result of construction operations is immaterial as compared to the naturally occurring reproductive and mortality rates of these species.

Given the short daily duration of sound associated with individual pile driving events, the relatively small areas being affected, the localized response of prey species, and the rapid return of any temporarily displaced species, pile driving activities are unlikely to have a permanent adverse effect on any prey habitat or prey species. Any impacts to marine mammal habitat are not expected to result in significant or long-term consequences for individual marine mammals, or to contribute to adverse impacts on their populations. NMFS considers potential adverse impacts to prey resources from construction activities in the action area to be immeasurably small.

Sound pressure levels generated by other activities of the proposed action (i.e., vessel traffic) may cause temporary behavioral changes of prey species at close range, such as a startle or stress response. Project-related vessel sounds are not expected to cause direct injury to fish, and will behaviorally affect fish only at close range, for a short period of time. A very small proportion of

primary prey species for listed marine mammals may also be temporarily disturbed by non-acoustic sources, including boat wakes and spinning propellers. Prey species may exhibit a startle or flight response, but these forms of disturbance would be temporary, with a geographic extent much smaller than the project action area.

Based on the above information, prey species may respond to noise associated with the proposed action by avoiding the immediate area. However, the expected impact of project activities on marine mammal prey is very minor, and thus adverse effects to Mexico DPS humpback whales and Western DPS Steller sea lions due to project-caused prey effects will be immeasurably small.

#### 6.1.1.4 Trash and Debris

The project may generate trash and debris, which could be released into the marine environment and pose risks to marine mammals. The MOS intends to comply with all applicable regulations, and will implement mitigation measures and construction best management practices to minimize, retrieve, and appropriately dispose of project-generated trash and debris. The expected impact of trash and debris is very minor, and thus adverse effects to ESA-listed species will be immeasurably small.

#### 6.1.1.5 Pollutants and Contaminants

Marine mammals could be exposed to authorized discharges through project vessels. Discharges associated with some marine commercial vessels are covered under a national NPDES Vessel General Permit (VGP) for Discharges Incidental to the Normal Operation of Vessels. Commercial vessels are covered under the VGP when discharging within the territorial sea extending three nautical miles from shore. When vessels are operating and discharging in Federal waters, the discharges are regulated under MARPOL 73/78, the International Convention for the Prevention of Pollution from Ships. The EPA completes consultation on the issuance of the VGP with the Services and receives separate biological opinions. Previously, these opinions have concluded that EPA's issuance of the VGP was not likely to jeopardize listed species or adversely modify designated or proposed critical habitat. An ESA consultation was completed for this general permit, impacts associated with marine vessel discharges were considered, and incidental take has been accounted for.

Accidental spills could occur from a vessel leak or onboard spill. The size of the spill influences the number of individuals that will be exposed and the duration of that exposure. Contact through the skin, eyes, or inhalation and ingestion could result in temporary irritation or long-term endocrine or reproductive impacts, depending on the duration of exposure. The greatest threat to cetaceans is likely from inhalation of volatile toxic hydrocarbon fractions of fresh oil, which can damage the respiratory system (Hansen 1985, Neff 1990), cause neurological disorders or liver damage (Geraci and St. Aubin 1990), have anaesthetic effects (Neff 1990), and cause death (Geraci and St. Aubin 1990). However, toxic fumes from small spills are expected to rapidly dissipate into the atmosphere as fresh refined oil ages quickly, limiting the potential exposure of marine mammals.

Based on the localized nature of small spills, the relatively rapid weathering and dispersion, and the safeguards in place to avoid and minimize oil spills, NMFS concludes that exposure of Mexico DPS humpback whales and Western DPS Steller sea lions to a small oil spill is extremely unlikely to occur. If exposure were to occur, NMFS does not expect detectable responses from listed marine mammals due to the ephemeral nature of small, refined oil spills.

### 6.1.2 Major Stressors on ESA-Listed Species and Critical Habitat

The following sections analyze the stressors likely to adversely affect ESA-listed species due to underwater anthropogenic sound. Construction activities will produce non-impulsive (i.e., vibratory pile driving) and impulsive (i.e., impact pile driving) sounds. First we provide a brief explanation of the sound measurements and acoustic thresholds used in the discussions of acoustic effects in this opinion.

#### 6.1.2.1 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 has developed comprehensive guidance on sound levels likely to cause injury to marine mammals through onset of permanent and temporary thresholds shifts (PTS and TTS; 83 FR 28824; June 21, 2018; 81 FR 51693; August 4, 2016). 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,[13] expressed in root mean square (rms),[14] 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) (16 U.S.C § 1362(18)(A)(ii)):

- impulsive sound: 160 $dB_{rms}$ re 1 µPa
- non-impulsive sound: 120 $dB_{rms}$ re 1µPa

Under the PTS/TTS Technical Guidance, NMFS uses the following thresholds (Table 5) for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (16 U.S.C § 1362(18)(A)(i); NMFS 2018b). Different thresholds and auditory weighting functions are provided for different marine mammal hearing groups, which are defined in the Technical Guidance (NMFS 2018b). The generalized hearing range for each hearing group is in (Table 6).

[13] 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.

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

**Table 5. PTS Onset Acoustic Thresholds for Level A Harassment (NMFS 2018).**

| Hearing Group | PTS Onset Acoustic Thresholds[1] (Received Level) | |
|---|---|---|
| | **Impulsive** | **Non-impulsive** |
| Low-Frequency (LF) Cetaceans | *L*pk,flat*:* 219 dB<br>*L*E,LF,24h*:* 183 dB | *L*E,LF,24h*:* 199 dB |
| Mid-Frequency (MF) Cetaceans | *L*pk,flat: 230 dB<br>*L*E,MF,24h: 185 dB | *L*E,MF,24h: 198 dB |
| High-Frequency (HF) Cetaceans | *L*pk,flat: 202 dB<br>*L*E,HF,24h: 155 dB | *L*E,HF,24h: 173 dB |
| Phocid Pinnipeds (PW) (Underwater) | *L*pk,flat: 218 dB<br>*L*E,PW,24h: 185 dB | *L*E,PW,24h: 201 dB |
| Otariid Pinnipeds (OW) (Underwater) | *L*pk,flat: 232 dB<br>*L*E,OW,24h: 203 dB | *L*E,OW,24h: 219 dB |

[1] 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. 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.

**Table 6. Underwater marine mammal hearing groups (NMFS 2018).**

| Hearing Group | ESA-listed Marine Mammals in the Project Area | Generalized Hearing Range[1] |
|---|---|---|
| Low-frequency (LF) cetaceans<br>*(Baleen whales)* | Blue whale, Fin whale, Sei whale, Mexico DPS humpback whale, WNP DPS humpback whale, North Pacific right whale | 7 Hz to 35 kHz |
| Mid-frequency (MF) cetaceans<br>*(dolphins, toothed whales, beaked whales)* | Sperm whale<br>Southern Resident DPS killer whale<br>Cook Inlet beluga whale | 150 Hz to 160 kHz |
| High-frequency (HF) cetaceans<br>*(true porpoises)* | None | 275 Hz to 160 kHz |
| Phocid pinnipeds (PW)<br>*(true seals)* | None | 50 Hz to 86 kHz |
| Otariid pinnipeds (OW)<br>*(sea lions and fur seals)* | Western DPS Steller sea lions | 60 Hz to 39 kHz |

[1] Respresents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 db threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al. 2007) and PW pinniped (approximation).

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.

Level A harassment radii can be calculated using the optional user spreadsheet[15] associated with NMFS Acoustic Guidance, or through modeling.

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 issued guidance interpreting the term "harass" under the ESA as to: "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016). For purposes of this consultation, any exposure to Level A or Level B disturbance sound thresholds under the MMPA constitutes an incidental "take" under the ESA and must be authorized by the ITS (Section 10 of this opinion; except that take is not prohibited for threatened species that do not have ESA section 4(d) regulations).

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

## 6.2 Exposure Analysis

As discussed in the *Approach to the Assessment* section of this opinion, exposure analyses are designed to identify the listed species 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 sex of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent. For critical habitat, exposure analyses identify any designated critical habitat likely to co-occur with effects and the nature of that co-occurrence. In this step of our analysis, we try to identify the physical and biological features likely to be exposed to an action's effects.

As discussed in Section 2.1.2 above, the Municipality of Skagway (MOS) proposed mitigation measures that should avoid or minimize exposure of Mexico DPS humpback whales and Western DPS Steller sea lions to one or more stressors from the proposed action.

NMFS expects that humpback whales and Steller sea lions will be exposed to underwater noise from pile driving activities (including impact pile driving and vibratory pile installation and removal). Possible responses by Mexico DPS humpback whales and Western DPS Steller sea

[15] NMFS User Spreadsheet Tool, version 2.2 (updated December 2020), available at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance, accessed July 2023.

lions to the sound produced by pile driving activities include:

- Physical Responses
  - Temporary or permanent hearing impairment (threshold shifts)
  - Non-auditory physiological effects
- Behavioral responses
  - Auditory interference (masking)
  - Tolerance or habituation
  - Change in dive, respiration, or feeding behavior
  - Change in vocalizations
  - Avoidance or displacement
  - Vigilance
  - Startle or fleeing/flight

### 6.2.1 Ensonified Area

This section describes the operational and environmental parameters of each construction activity that allow NMFS to estimate the area ensonified above the acoustic behavioral thresholds, based on only a single construction activity occurring at a time, as proposed by MOS.

The sound field in the action area is the existing background noise plus additional construction noise from the proposed project. Marine mammals may be affected via sound generated by the primary components of the project (i.e., impact pile driving and vibratory pile installation and removal). NMFS used acoustic monitoring data from other locations to develop the source levels used to calculate distances to the Level A and Level B thresholds for different sizes of piles and installation/removal methods. The values used and the source from which they were derived are summarized in Table 7.

To help implement the 2018 Technical Guidance (NMFS 2018b), NMFS developed a spreadsheet tool that incorporates the duration of an activity into the estimation of a distance to the Level A isopleth. This estimation can then be used in conjunction with marine mammal density or occurrence to help predict exposures. The isopleths may be overestimates and the resulting Level A harassment numbers almost certainly overestimate how many marine mammals actually experience PTS if they cross the Level A isopleth for fairly brief amounts of time; this is due to some of the assumptions included in the methods of these tools. Until more sophisticated modeling methods are widely available, these tools offer the best available way to conservatively predict appropriate isopleths. NMFS continues to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources such as vibratory and impact pile driving, the NMFS User Spreadsheet predicts the distance at which a marine mammal would incur PTS if it remained at that distance for the duration of the activity.

Inputs used in the User Spreadsheet are shown in Table 7, and the resulting Level A isopleths are shown in Table 8. Level A harassment thresholds for impulsive sound sources are defined for both cumulative sound exposure levels (SELcum) and peak sound pressure level (SPLPK), with the threshold that results in the largest modeled isopleth for each marine mammal hearing group used to establish the Level A harassment isopleth.

**Table 7. NMFS User Spreadsheet Inputs for Calculating Level A and Level B isopleths[1].**

| Activity | Method | Pile Size/Type | Weighting Adjustment Factor | # of Piles[2] | Piles per Day | Duration/ Impacts per Pile | Sound Source Level at 10 m | Reference |
|---|---|---|---|---|---|---|---|---|
| Permanent Removal | Vibratory | ≤ 14-inch[3] Timber | 2.5 | 423 | 18 | 21 min/pile | 158 dB rms | Greenbusch (2018) |
| | | ≤ 30-inch[4] Steel | 2.5 | 269 | 5 | 45 min/pile | 159 dB rms | CalTrans (2020) |
| Permanent Installation | Vibratory | 24-inch Steel | 2.5 | 170 | 5 | 45 min/pile | 159 dB rms | CalTrans (2020) |
| | | ≥ 36-inch[5] Steel | 2.5 | 74 | 5 | 45 min/pile | 170 dB rms | CalTrans (2020) |
| | Impact | 24-inch Steel | 2 | 170 | 5 | 700 strikes | 189 dB rms | CalTrans (2020) |
| | | ≥ 36-inch[5] Steel | 2 | 74 | 2 | 1,800 strikes | 193 dB rms | CalTrans (2020) |
| Temporary Install + Remove | Vibratory | ≤ 24-inch[6] Steel | 2.5 | 72 | 5 | 45 min/pile | 159 dB rms | CalTrans (2020) |

[1] All calculations use a transmission loss of 15.
[2] In total, 170 steel 24-inch piles and 74 steel ≥ 36-inch piles will be permanently installed; 36 temporary piles will be installed and removed.
[3] Includes 11-inch and 14-inch timber piles.
[4] Includes 10.75-inch, 14-inch, 16-inch, 20-inch, 24-inch, 28-inch, and 30-inch piles.
[5] Includes 36-inch, 42-inch, and 48-inch piles.
[6] Exact pile size to be determined.

**Table 8. Level A and Level B Harassment Isopleths for Pile Driving Activities[1].**

| Method[1] | Pile Size/Type | Level A Harassment (m) | | Level B Harassment (m) |
|---|---|---|---|---|
| | | LF Cetaceans | Otariids | |
| Vibratory | ≤ 14-inch[2] Timber | 14.7 | 0.6 | 3,415 |
| | ≤ 30-inch[3] Steel | 12.1 | 0.5 | 3,981 |
| | ≥ 36-inch[4] Steel | 65.6 | 2.8 | 16,300[5] |
| Impact | 24-inch Steel | 1,245.8 | 48.5 | 858 |
| | ≥ 36-inch[4] Steel | 2,345.7 | 91.4 | 1,585 |

[1] Includes installation and removal of permanent and temporary piles.
[2] Includes 11-inch and 14-inch timber piles.
[3] Includes 10.75-inch, 14-inch, 16-inch, 20-inch, 24-inch, 28-inch, and 30-inch piles.
[4] Includes 36-inch, 42-inch, and 48-inch piles.
[5] The calculated Level B harassment zone is 21,544 m, which is truncated to 16,300 m due to the landmass structure.

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

The proposed construction activity for the Ore Terminal redevelopment project includes the use of non-impulsive and impulsive sources, and therefore the 120 and 160 dB re 1 µPa rms thresholds for Level B behavioral harassment are applicable.

Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

TL = B * Log10 (R1/R2), where
TL = transmission loss in dB
B = transmission loss coefficient
R1 = the distance of the modeled SPL from the driven pile
R2 = the distance from the driven pile of the initial measurement

When site-specific transmission loss measurements are unavailable, the recommended TL coefficient for most nearshore environments is the default practical spreading value of 15. This value results in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions, which is the most appropriate assumption for the proposed activity.

Using the practical spreading model, the underwater noise was determined to fall below the Level B threshold of 120 dB rms for marine mammals at a maximum radial distance of 21,544 m for vibratory installation of ≥ 36-inch piles. The geography of Taiya Inlet, however, obstructs underwater sound transmission and the maximum Level B harassment zone for the project is truncated to 16,300 m (Figure 5). Other pile driving activities, including impact pile driving and vibratory pile installation and removal of smaller piles, have smaller Level B harassment zones. All Level B harassment isopleths are reported in Table 8.

### 6.2.2 Marine Mammal Occurrence and Exposure Estimates

Limited sightings data exist for Taiya Inlet and at-sea densities have not been determined for marine mammals in the area. Scientific literature, previous monitoring reports from construction projects in Taiya Inlet, and local knowledge from tour guide operators were referenced to estimate marine mammal occurrence and abundance in the construction action area.

#### *Mexico DPS Humpback Whales*

Humpback whales are present in Southeast Alaska all months of the year, and one or more Southeast BIAs are active between March and December. The closest BIA to the construction area is located in Southern Lynn Canal and Northern Chatham Strait, and is active from June through September (Wild et al. 2023).

Local observations indicate humpback whales occur in Taiya Inlet most commonly during the eulachon run in April and May in relatively low numbers and for brief periods of time (NMFS 2019). A local charter boat captain estimated that four humpbacks could occur near Skagway during the spring eulachon run (NMFS 2019). Marine mammal monitoring was conducted for 53 days between March and May 2019 in conjunction with construction at the Railroad Dock near Skagway. A single humpback whale was observed on May 1 and May 4 (WP&YR 2019). Dredging at the Ore Terminal occurred for 17 days at the end of March and early April in 2022, and no humpbacks were observed during the marine mammal monitoring effort.

Humpback whale sightings have not been reported in Taiya Inlet during the winter months, which is consistent with seasonal migration patterns. Due to the absence of site-specific data during the planned construction season (October 1 to March 31), the Navy Marine Species Density Database for U.S. Pacific & Gulf of Alaska was referenced.[16] The Database provided a winter–spring density estimate of 0.0081 humpbacks/km$^2$ in the Behm Canal, which is located in southern Southeast Alaska.

[16] https://seamap.env.duke.edu/models/Pacific-GOA/ accessed July 2023.

Estimated exposure was calculated by multiplying the species density by the ensonified area and the number of work days for each type of pile driving activity. The ensonified areas are the overall areas of disturbance, based on the calculated distances to attenuation below harassment thresholds for each type of pile driving activity. The expected duration for each activity type is estimated in Table 9. Of note, the number of days for vibratory pile driving of ≤ 30-inch piles was reduced from the calculated 102.2 to 85.8 days based on communication from MOS. The temporary piles will be installed and/or removed on days that other pile driving is occurring, reducing the number of days of activity by 14.4, and 10 of the 24-inch piles are expected to be installed faster in shallow water, reducing the days of activity by another 2 days.

*Exposure estimate = species density x ensonified area x days of pile driving activity*

NMFS AKR estimates that 12 humpback whales (rounded up from 11.6) could be exposed to Level B harassment from pile driving noise (Table 9). Here we assume that if an animal is present in the ensonified area, it will be exposed to acoustic harassment, acknowledging that not all animals within the action area will be so exposed. Two percent of humpback whales in Southeast Alaska are expected to be from the ESA-listed Mexico DPS (Wade 2021). Therefore, NMFS expects that a fraction of one individual, rounded up to one individual, from the Mexico DPS may be exposed to Level B harassment from pile driving noise. NMFS Permits Division rounded up throughout each step of their calculation process, as opposed to at the end, and estimated that 14 humpbacks could be exposed to Level B harassment. Regardless, the result would round up to one Mexico DPS humpback potentially exposed to Level B harassment.

**Table 9. Estimated Level B Harassment Exposures of Humpback Whales.**

| Method[1] | Pile Size/ Type | # of Piles | Piles per Day | Days of Activity | Ensonified Area | Density (animals/km$^2$) | Estimated Exposures |
|---|---|---|---|---|---|---|---|
| Vibratory | ≤ 14-inch[2] Timber | 423 | 18 | 23.5 | 8.06 | 0.0081 | 1.53422 |
| | ≤ 30-inch[3] Steel | 511 | 5 | 85.8* | 9.08 | | 6.31042 |
| | ≥ 36-inch[4] Steel | 74 | 5 | 14.8 | 20.36 | | 2.44076 |
| Impact | 24-inch Steel | 170 | 5 | 34 | 1.23 | | 0.33874 |
| | ≥ 36-inch[4] Steel | 74 | 2 | 37 | 3.23 | | 0.96803 |
| | | | | | | Total Humpbacks | 11.59217 |
| | | | | | | Mexico DPS | 1 |

[1] Includes installation and removal of permanent and temporary piles.
[2] Includes 11-inch and 14-inch timber piles.
[3] Includes 10.75-inch, 14-inch, 16-inch, 20-inch, 24-inch, 28-inch, and 30-inch piles. Of these piles, 269 will be removed, 170 permanent piles will be installed, and 36 temporary piles will be installed and removed.
[4] Includes 36-inch, 42-inch, and 48-inch piles.

[*] The number of days was reduced from the calculated 102.2 to 85.8 days based on communication from MOS, indicating that: temporary piles will be installed and/or removed on days that other pile driving is occurring, reducing the number of days of activity by 14.4; and, an estimated 10 of the 24-inch piles will be installed faster in the shallow area, reducing the number of days of activity by 2.

NMFS Permits Division intends to issue two takes for Level A harassment of humpback whales. The maximum distance at which a humpback whale may be exposed to noise levels that exceed Level A thresholds is ~2,346 m during impact hammering. Three PSOs will be on-watch during impact pile driving, and the shutdown zones can be effectively monitored and mitigation implemented. The large size of humpback whales increases the likelihood of detection; however, should a humpback be observed within the Level A harassment zone, the mitigation measures make it unlikely that an animal would accumulate enough exposure for PTS to occur. For these reasons, and due to the small percentage of Mexico DPS humpback whales occurring in the action area, no take of ESA-listed humpback whales by Level A harassment is expected or authorized by NMFS AKR.

### *Western DPS Steller Sea Lion*

The construction action area and surrounding waters contain abundant sources of prey species in which Steller sea lions forage year-round. Lutak Inlet, located southwest of the project site, attracts high numbers of Steller sea lions during the spring eulachon spawning (Womble et al. 2005). There are two known Steller sea lion haulouts in the vicinity of the construction action area. Taiya Point is located approximately 18 km south of the construction site and is a temporary haulout used during the Lutak Inlet eulachon run. Gran Point is located approximately 36 km downstream in Lynn Canal and is a major haulout that has been designated as critical habitat.

Local observations indicate that Steller sea lions may be abundant in Taiya Inlet, particularly during the eulachon run in April and May. Approximately 40 Steller sea lions utilize Taiya Point as a seasonal haulout during this time period. Marine mammal monitoring was conducted for 53 days between March and May 2019 in conjunction with the installation of supporting mooring dolphins at the Railroad Dock near Skagway. A total of 165 Steller sea lions were observed during 27 monitoring days; sightings were of single animals and rafts up to 25 animals (WP&YR 2019). Most of the sightings were recorded in April; however, 66 sightings were recorded over 7 days in early May, when the project ended (WP&YR 2019). Dredging at the Ore Terminal occurred for 17 days at the end of March and early April in 2022, and 3 or 4 animals were observed on March 27 during the marine mammal monitoring effort. Fewer sea lions are expected to occur in the area during the winter months.

Due to the lack of site-specific data during the planned construction season (October 1 to March 31), local observations and sighting records from marine mammal monitoring reports were used to estimate Steller sea lion occurrence. NMFS estimates that one Steller sea lion may be present in the construction action area during any given day of pile driving activities. MOS has estimated 196 days of pile driving operations and NMFS estimates that 196 Steller sea lions could be exposed to Level B harassment from pile driving noise. Here we assume that if an animal is present in the ensonified area, it will be exposed to acoustic harassment, acknowledging that not all animals within the action area will be so exposed. Steller sea lions in the construction action area are expected to be predominantly from the Eastern DPS. Of the Steller sea lion nonpups (1+ years old) in Lynn Canal, it is estimated that 1.4 percent belong to the Western DPS (Hastings et al. 2020), and we assume that 1.4 percent of the animals in the action area will be from the Western DPS. Therefore, NMFS expects that 2.7 individuals, rounded up to 3 individuals, from

the Western DPS may be exposed to Level B harassment from pile driving noise.

NMFS Permits Division intends to issue two takes for Level A harassment of Steller sea lions. The maximum distance at which a Steller sea lion may be exposed to noise levels that exceed Level A thresholds is ~91 m during impact hammering. Three PSOs will be on-watch during impact pile driving, and the shutdown zones can be effectively monitored and mitigation implemented. Should a Steller sea lion go undetected initially, and later be observed within the Level A harassment zone, the mitigation measures make it unlikely that an animal would accumulate enough exposure for PTS to occur. For these reasons, and due to the small percentage of Western DPS Steller sea lions occurring in the action area, no take of ESA-listed Steller sea lions by Level A harassment is expected or authorized by NMFS AKR.

Table 10 summarizes the estimated exposures of Mexico DPS humpback whales and Western DPS Steller sea lions to pile driving sound.

**Table 10. Estimated Exposures of ESA-listed Species.**

| Species | Level A | Level B[1] |
|---|---|---|
| Mexico DPS humpback whale | 0 | 1 |
| Western DPS Steller sea lion | 0 | 3 |

[1] Exposure estimates are rounded up to the nearest whole number.

## 6.3 Response Analysis

As discussed in the *Approach to the Assessment* section of this opinion, response analyses determine how listed species / critical habitats 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. For critical habitat, our assessments try to identify which of the action's effects will impact or alter the physical and biological features of critical habitat and the magnitude of the impacts or alterations relative to the value of critical habitat as a whole for the conservation of a listed species. Ideally, our response analyses consider and weigh evidence of adverse consequences, beneficial consequences, or the absence of such consequences.

Loud underwater noise can result in physical effects on the marine environment that can affect marine organisms. Possible responses by Mexico DPS humpback whales and Western DPS Steller sea lions to the impulsive and non-impulsive sound produced by pile installation and removal and vessel noise include:

- Physical Response
    - Temporary or permanent hearing impairment (threshold shifts)
    - Non-auditory physiological effects
- Behavioral responses
    - Auditory interference (masking)
    - Tolerance or habituation
    - Change in dive, respiration, or feeding behavior

- Change in vocalizations
- Avoidance or displacement
- Vigilance
- Startle or fleeing/flight

### 6.3.1 Responses to Major Noise Sources (Pile Driving/Removal Activities)

As described in the Exposure Analysis, Mexico DPS humpback whales and Western DPS Steller sea lions are expected to occur in the action area and to overlap with noise associated with pile installation and removal activities. We assume that some individuals are likely to be exposed and respond to these impulsive and non-impulsive noise sources.

With proper implementation of the mitigation measures and shutdown procedures described in Section 2.1.2, we do not expect that any listed marine mammals will be exposed to noise levels loud enough, long enough, or at distances close enough for the proposed action to cause Level A harassment. We expect no more than one exposure of Mexico DPS humpback whales and 3 exposures of Western DPS Steller sea lions to noise levels sufficient to cause Level B harassment, as described in Section 6.2.2. All level B instances of take are expected to occur at received levels greater than 120 dB and 160 dB for non-impulsive and impulsive noise sources, respectively.

The introduction of anthropogenic noise into the aquatic environment from pile driving activities is the primary means by which marine mammals may be harassed from project activities covered in this opinion. In general, animals exposed to natural or anthropogenic sound may experience physical and physiological effects, ranging in magnitude from none to severe (Southall et al. 2007). Exposure to anthropogenic noise can also lead to non-observable physiological responses such an increase in stress hormones. Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection.

Exposure to pile driving and removal noise has the potential to result in auditory threshold shifts and behavioral reactions (e.g., avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). The effects of pile driving and removal noise on marine mammals are dependent on several factors, including, but not limited to, sound type (e.g., impulsive vs. non-impulsive), the species, age and sex class (e.g., adult male vs. cow with calf), duration of exposure, the distance between the pile and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok et al. 2003, Southall et al. 2007). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects.

#### 6.3.1.1 Threshold Shifts

NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018b). In other words, a threshold shift is a hearing impairment, and may be temporary (such as ringing in your ears after a loud rock concert) or permanent (such as the loss of the ability to hear certain frequencies or partial or

complete deafness). There are numerous factors to consider when examining the consequence of TS, including: the signal's temporal pattern (e.g., impulsive or non-impulsive); likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS; the magnitude of the TS; time to recovery; the frequency range of the exposure (i.e., spectral content); the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (i.e., how and animal uses sound within the frequency band of the signal; Kastelein et al. 2014); and, the overlap between the animal and the sound (e.g., spatial, temporal, and spectral; NMFS 2018b). The amount of threshold shift is customarily expressed in dB.

### *Temporary Threshold Shift*

Temporary threshold shift (TTS) is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter 1970). 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 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 exist on the sound levels and durations necessary to elicit mild TTS in marine mammals, and none of the published data describe TTS elicited by exposure to multiple pulses of sound. Available data on TTS in marine mammals are summarized in (Southall et al. 2007).

Although some Level B exposures may occur during the course of the proposed action, not all instances of Level B take will result in TTS because the estimated noise thresholds for the onset of TTS are conservative. If TTS does occur, it is expected to be mild and temporary and not likely to affect the long term fitness of the affected individuals.

### *Permanent Threshold Shift*

When permanent threshold shift (PTS) occurs, there is physical damage to the sound receptors in the ear. The animal will have an impaired ability to hear sounds in specific frequency ranges, and there can be total or partial deafness in severe cases (Kryter 1985). There is no specific evidence that exposure to pulses of sound can cause PTS in any marine mammal. However, given the possibility that mammals close to a sound source can incur TTS, it is possible that some individuals will incur PTS. Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage, but repeated or (in some cases) single exposures to a level well above that causing the onset of TTS 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 which induces mild TTS, if the animal were exposed to strong sound pulses with rapid rise time. For non-impulsive exposures (i.e., vibratory pile driving), a variety of terrestrial and marine mammal data sources indicate that threshold shift up to 40 to 50 dB may be induced without PTS, and that 40 dB is a conservative upper limit for threshold shift to prevent PTS. An exposure causing 40 dB of TTS is, therefore, considered equivalent to PTS onset (NMFS 2018b).

The shutdown zones to be implemented are larger than the calculated isopleths to ensure that no listed marine mammals are exposed to noise levels that could cause PTS or other Level A disturbance. No exposures are expected at levels resulting in PTS due to conservative estimates of Level A isopleths and implementation of mitigation measures that will result in a shutdown of pile driving activities if a humpback whale or Steller sea lion approaches a Level A zone.

#### 6.3.1.2 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, internal 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 activities 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 of time. 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 are especially unlikely to incur auditory impairment or non-auditory physical effects.

An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (Moberg 2000). In many cases, an animal's first, and sometimes most economical (in terms of energetic costs), response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

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

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (Jessop et al. 2003, Lankford et al. 2005, Crespi et al. 2013). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker 2000, Romano et al. 2002) and, more rarely, studied in wild populations (Romano et al. 2002). For example, noise reduction from reduced ship traffic in the Bay of Fundy following September 11, 2001 was linked to a significant decline in fecal stress

hormones in North Atlantic right whales, suggesting that chronic exposure to increased noise levels, although not acutely injurious, can produce stress (Rolland et al. 2012). These stress hormones returned to their previous level within 24 hours after the resumption of shipping traffic. Exposure to loud noise can also adversely affect reproductive and metabolic physiology (Kight and Swaddle 2011). In a variety of factors, including behavioral and physiological responses, females appear to be more sensitive or respond more strongly than males (Kight and Swaddle 2011).

These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress". In addition, any animal experiencing TTS would likely also experience stress responses (NRC 2003).

The estimated 196 days of pile driving activities will be staggered between the months of October and March, and will occur for a limited amount of time on each day of in-water work, thus limiting the potential for chronic stress. Marine mammals that show behavioral avoidance of pile driving are especially unlikely to incur auditory impairment or non-auditory physical effects because they will be limiting the duration of their exposure.

#### 6.3.1.3 Behavioral Disturbance Reactions

Behavioral responses are influenced by an animal's assessment of whether a potential stressor poses a threat or risk. Behavioral responses may include: changing durations of surfacing and dives, number of blows per surfacing, or changing 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.

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

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok et al. 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. Behavioral state may affect the type of response as well. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson et al. 1995, NRC 2003, Wartzok et al. 2003).

Controlled experiments with captive marine mammals showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway et al. 1997, Finneran et al. 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic guns or

acoustic harassment devices, but also including pile driving) have been varied but often consist of avoidance behavior or other behavioral changes, suggesting discomfort (Morton and Symonds 2002, Wartzok et al. 2003, Thorson and Reyff 2006, Nowacek et al. 2007). Responses to non-impulsive sound, such as vibratory pile installation, have not been documented as fully as responses to pulsed sounds.

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 biologically significant if the change affects growth, survival, or fitness. Significant behavioral modifications that could potentially lead to effects on growth, survival, or fitness include:

- Drastic changes in diving/surfacing patterns;
- Longer-term habitat abandonment due to loss of desirable acoustic environment;
- Longer-term cessation of feeding or social interaction; and,
- Cow/calf separation.

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).

#### 6.3.1.4 Auditory Masking

Natural and artificial sounds can disrupt behavior by masking, or interfering with, a marine mammal's ability to hear other sounds. Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher levels. Chronic exposure to excessive, though not high-intensity, sound could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions. Masking can interfere with detection of acoustic signals such as communication calls, echolocation sounds, and environmental sounds important to marine mammals. Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance or 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 threshold shift) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

Masking occurs at the frequency band the animals utilize, so the frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Lower frequency man-made sounds are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey sound. Anthropogenic sounds may also affect communication signals when both occur in the same sound band and thus reduce the

communication space of animals (Clark et al. 2009), and cause increased stress levels (Foote et al. 2004, Holt et al. 2009).

Masking has the potential to affect species at the population or community levels as well as at individual levels. Masking affects both senders and receivers of the signals and can potentially have long-term chronic effects on marine mammal species and populations. Recent research suggests that low frequency ambient sound levels have increased by as much as 20 dB (more than a three-fold increase in terms of SPL) in the world's ocean from pre-industrial periods, and that most of these increases are from distant shipping (Hildebrand 2009). All anthropogenic sound sources, such as those from vessel traffic, pile driving, and dredging activities, contribute to the elevated ambient sound levels, thus intensifying masking.

Noise from pile driving activities is relatively short-term. It is possible that pile driving noise or vessel noise resulting from this proposed action may mask acoustic signals important to Mexico DPS humpback whales and Western DPS Steller sea lions. However, the limited affected area and infrequent occurrence of humpback whales in the action area would result in insignificant impacts from masking.

Masking is likely less of a concern for Steller sea lions, which vocalize both in air and water and do not echolocate or communicate with complex underwater “songs”. Any masking event that could possibly rise to MMPA Level B harassment of sea lions would occur concurrently within the zones of behavioral harassment already estimated for pile driving activities, which have already been taken into account in the Exposure Analysis.

### 6.3.2 Response Analysis Summary

Probable responses of humpback whales and Steller sea lions to pile installation and removal include TTS, increased stress, and/or short-term behavioral disturbance reactions such as changes in activity and vocalizations, masking, avoidance or displacement, or habituation. These reactions and behavioral changes are expected to be temporary and subside quickly when the exposure ceases. The primary mechanism by which these behavioral changes may affect the fitness of individual animals is through the animals’ energy budget, time budget, or both (the two are related because foraging requires time). We expect most animals would leave the area during pile driving activities if they were disturbed, and high-quality habitat is located throughout Southeast Alaska. The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to reduce the energy budgets of humpback whales and Steller sea lions, and their probable exposure to noise sources are not likely to reduce their fitness.

# 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.

## 7.1 Vessel Traffic and Tourism

Vessel traffic is expected to continue in Taiya Inlet. Year-round marine traffic includes daily passenger ferries, weekly cargo barges with occasional special deliveries, fuel delivery barges every three weeks, and bulk ore vessels approximately four times a year, depending on mining operations.

Tourism is the main industry in Skagway; cruise ship and related tourism is responsible for 96 percent of Skagway's economy. From April to October, cruise ships make a port of call almost daily. The number of cruise ship calls ranged between 380 and 446 from 2013 to 2019. In 2022, 475 cruise ship carrying approximately 1.2 million passengers were scheduled to visit Skagway, and 500 cruise ships are scheduled to visit in 2023. Additionally, small vessel trips, including fishing charters, scenic and wildlife tours, and passenger ferries increase during the cruise ship season to accommodate the influx of tourists.

It is unknown whether overall vessel traffic will increase in the future, as this depends largely on population growth, economics, tourism, and other factors, but it is unlikely to decrease significantly. As a result, there will be continued risk to marine mammals of ship strikes, exposure to vessel noise and presence, and small spills.

# 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 both 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 direct or indirect alterations that appreciably diminish the value of designated critical habitat as a whole 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.

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

## 8.1 Mexico DPS Humpback Whale Risk Analysis

Based on the results of the exposure analysis, we expect a maximum of 12 humpback whales may be exposed to noise from pile driving; two percent, or a maximum of one of these whales, are expected to be from the Mexico DPS.

Exposure to project-related vessel noise and risk of vessel strike may occur, but adverse effects from vessel disturbance and noise are likely to be insignificant due to the small marginal increase in such activities relative to the environmental baseline, the transitory nature of project-related vessel traffic, and the likely habituation of marine mammals that frequent this moderately trafficked area. Adverse effects from vessel strikes are considered extremely unlikely because of the few additional vessels introduced by the action, slow speeds at which these vessels will operate, and existing regulations regarding approaching whales.

Disturbance to seafloor, habitat, and prey resources are not expected to adversely affect humpback whales because these disturbances are temporary, and the action area is not important habitat to humpback whales for foraging, migrating, breeding, or other essential life functions. Mitigation measures and adherence to Clean Water Act regulations are expected to minimize the risk of exposure of humpback whales to the potential introduction of pollutants into the action area.

Taiya Inlet is not known to be highly utilized by humpback whales in general, and especially during the proposed construction season, which is the strongest evidence supporting the conclusion that the proposed action will likely have minimal impact on humpback whale populations.

The most likely responses from humpback whales to noise from pile driving activities include brief startle reactions or short-term behavioral modification. These reactions are expected to subside quickly when the exposure to pile driving noise ceases. The primary mechanism by which the behavioral changes we have discussed affect the fitness of individual animals is through the animals' energy and time budget. Large whales such as humpbacks have an ability to survive for months on stored energy during migration and while in their wintering areas, and their feeding patterns allow them to acquire energy at high rates. The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to measurably increase energetic costs of humpback whales, and their probable exposure to project-related noise is not likely to reduce their fitness.

The implementation of mitigation measures (including shutdown zones) to reduce exposure to high levels of sound decrease the likelihood of a behavioral response that may affect vital

functions, or cause TTS or PTS of humpback whales. Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of Mexico DPS humpback whales.

## 8.2 Western DPS Steller Sea Lion Risk Analysis

Exposure to vessel noise and presence, marine debris, seafloor disturbance and turbidity, and small oil spills may occur, but such exposure would have a very small impact, and we conclude that these stressors will not result in take of Steller sea lions. The increase in ship traffic due to the proposed action is unlikely to result in a vessel strike. Project vessels will be traveling at slow speeds, the increase in vessel traffic will be small, and vessel strike is not considered a significant concern for Steller sea lions (only four reports of potential vessel strikes involving Steller sea lions have been reported in Alaska).

Exposure to non-biodegradable marine debris, specifically to debris that can cause entanglement, remains an unquantifiable risk, but associated effects from this project would be minimal. Best practices regarding waste management (cutting loops prior to disposal) will further reduce the impact of debris on Steller sea lions. Any increases in turbidity or seafloor disturbance would be temporary, localized, and minimal. Based on the localized nature of small oil spills, the relatively rapid weathering expected, and the safeguards in place to avoid and minimize oil spills, we conclude that the probability of the proposed action causing a small oil spill and exposing Western DPS Steller sea lions is extremely small, and thus the effects are considered highly unlikely to occur.

It is difficult to estimate the behavioral responses, if any, that Western DPS Steller sea lions in the action area may exhibit to underwater sounds generated by project activities. Though the sounds produced during project activities may not greatly exceed levels that Steller sea lions already experience in Taiya Inlet, the sources proposed for use in this project are not among sounds to which they are commonly exposed. In response to project-related sounds, some Steller sea lions may move out of the area or change from one behavioral state to another, while other Steller sea lions may exhibit no apparent behavioral changes at all.

The primary mechanism by which the behavioral changes may affect the fitness of individual animals is through the animal's energy budget, time budget, or both. Most adult Steller sea lions occupy rookeries during the pupping and breeding season, which extends from late May to early July (NMFS 2008b). The closest rookery is approximately 210 km as the crow flies from the proposed project site, and the nearest major haulout is 36 km downstream of the proposed project site. The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to measurably reduce the energy budgets of Steller sea lions in the action area.

The probable responses (i.e., tolerance, avoidance, short-term masking, and short-term vigilance behavior) to close approaches by vessel operations and their probable exposure to noise from pile driving are not likely to reduce the current or expected future reproductive success or reduce the rates at which Steller sea lions grow, mature, or become reproductively active. Therefore, these exposures are not likely to reduce the abundance, reproduction rates, or survival and growth rates of the population those individuals represent.

Based on the results of the exposure analysis, we expect a maximum of 196 Steller sea lions may be exposed to noise from pile driving; 1.4 percent, or a maximum of 3 of these sea lions, are expected to be from the Western DPS. These estimates represent the maximum number of takes that may be expected to occur, but not necessarily the number of individuals taken, as a single individual may be taken multiple times over the course of the proposed action. Noise from pile driving is likely to cause some individual Steller sea lions to experience changes in their behavioral states that might have adverse consequences (Frid and Dill 2002). However, these responses are not likely to alter the physiology, behavioral ecology, or social dynamics of individual Steller sea lions in ways or to a degree that would reduce their fitness.

The implementation of mitigation measures (including shutdown zones) to reduce exposure to high levels of sound decrease the likelihood of a behavioral response that may affect vital functions, or cause TTS or PTS of Steller sea lions. Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival or recovery of Western DPS Steller sea lions.

# 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 the Mexico DPS humpback whale or Western DPS Steller sea lion. NMFS also concludes that the proposed action is not likely to adversely affect the blue whale, fin whale, sei whale, WNP DPS humpback whale, North Pacific right whale, sperm whale, Southern Resident DPS killer whale, Cook Inlet beluga whale, or sunflower sea star or to destroy or adversely modify designated critical habitat for the Mexico DPS humpback whale, WNP DPS humpback whale, Southern Resident killer whale, Cook Inlet beluga whale, or Steller sea lion. No critical habitat has been designated or proposed for the blue whale, fin whale, sei whale, sperm whale, or sunflower sea star, therefore, none will be affected.

# 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 (16 U.S.C. § 1532(19)). "Incidental take" is defined as take that results from, but is not the purpose of, the carrying out of an otherwise lawful activity conducted by the action agency or applicant (50 CFR § 402.02). Based on NMFS guidance, the term "harass" under the ESA means to: "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016). The MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has

the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (16 U.S.C. § 1362(18)(A)(i) and (ii)). The USACE and NMFS Permits Division expect both Level A and Level B takes of humpback whales and Steller sea lions. For this consultation, NMFS AKR expects that any take of Mexico DPS humpback whales or Western DPS Steller sea lions will be by Level B harassment only. No Level A takes are expected or authorized in this biological opinion.

The ESA does not prohibit the take of threatened species unless special regulations have been promulgated, pursuant to ESA section 4(d), to promote the conservation of the species. Federal regulations promulgated pursuant to section 4(d) of the ESA extend the section 9 prohibitions to the take of Mexico DPS humpback whales (50 C.F.R. § 223.213).

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.

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. NMFS Permits Division and USACE have a continuing duty to regulate the activities covered by this ITS. In order to monitor the impact of incidental take, the Municipality of Skagway must monitor and report on the progress of the action and its impact on the species as specified in the ITS (50 CFR § 402.14(i)(3)). If NMFS Permits Division and USACE (1) fail to require the permit holder to adhere to the terms and conditions of the ITS through enforceable terms that are added to the authorization, and/or (2) fail to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

### 10.1 Amount or Extent of Take

Section 7 regulations require NMFS to estimate the number of individuals that may be taken by the proposed actions or utilize a surrogate (e.g., other species, habitat, or ecological conditions) if we cannot assign numerical limits for animals that could be incidentally taken during the course of an action (50 CFR § 402.14(i)(1); see also 80 FR 26832; May 11, 2015).

The taking of Mexico DPS humpback whales and Western DPS Steller sea lions will be by incidental harassment only. The taking by serious injury or death is prohibited and will result in the modification, suspension, or revocation of the ITS. Table 11 lists the amount and timing of authorized take (incidental take by harassment) for this action. The method for estimating the

number of listed species exposed to sound levels expected to result in Level B harassment is described in Section 6.2. NMFS expects that 12 instances of Level B harassment of humpback whales may occur. While we are only authorizing take of one Mexico DPS humpback whale under the ESA, we will consider the ESA-authorized take limit to be exceeded when the MMPA-authorized limit on Level B take of humpback whales is exceeded, as it is impossible to distinguish between humpback whale DPSs in the field. NMFS expects that 196 instances of Level B harassment of Steller sea lions may occur. While we are only authorizing take of three Western DPS Steller sea lions under the ESA, we will consider the ESA-authorized take limit to be exceeded when the MMPA-authorized limit on Level B take of Steller sea lions is exceeded.

Pile driving activities will be halted as soon as possible when it appears a humpback whale or Steller sea lion is approaching the Level A shutdown zone and before it reaches the Level A isopleth. No Level A take of ESA-listed marine mammals is authorized in this biological opinion.

**Table 11. Incidental Take of ESA-listed Species Authorized.**

| Species | Total Amount of Take | | Duration Across which Take Will Occur |
|---|---|---|---|
| | Level A | Level B | |
| Western DPS Steller sea lion (*Eumetopias jubatus*) | 0 | 3 | One or two construction seasons (October 1 – March 31) |
| Mexico DPS Humpback whale (*Megaptera novaeangliae*) | 0 | 1 | |

## 10.2 Effect of the Take

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 the species or destruction or adverse modification of critical habitat.

The takes from the proposed action are associated with behavioral harassment from pile driving activities. Although the biological significance of behavioral responses remains unknown, this consultation has assumed that exposure to pile driving activities might disrupt one or more behavioral patterns that are essential to an individual animal's life history. However, any behavioral responses of these whales and pinnipeds to noise sources and any associated disruptions are not expected to affect the fitness of any individuals of these species, the viability of the population, or the species' survival or recovery.

## 10.3 Reasonable and Prudent Measures

Reasonable and prudent measures (RPMs) are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). Failure to comply with RPMs (and the terms and conditions that implement them) may invalidate the take exemption and result in unauthorized take.

RPMs are distinct from the mitigation measures that are included in the proposed action (described in Section 2.2). We presume that the mitigation measures will be implemented as

described in this opinion. The failure to do so will constitute a change to the action that may require reinitiation of consultation pursuant to 50 CFR § 402.16.

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

1. The NMFS Permits Division and USACE will require the MOS to conduct operations in a manner that will help minimize impacts to Mexico DPS humpback whales and Western DPS Steller sea lions that occur within or in the vicinity of the project action area.
2. The NMFS Permits Division and USACE will require the MOS to implement a comprehensive monitoring program to ensure that Mexico DPS humpback whales and Western DPS Steller sea lions are not taken in numbers or in a manner not anticipated by this opinion, and to submit a final report to NMFS AKR evaluating the mitigation measures and the results of the monitoring program.

### 10.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. These terms and conditions are in addition to the mitigation measures included in the proposed action, as set forth in Section 2.1.2 of this opinion. The NMFS Permits Division and USACE 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(i)(3))).

Any taking that is in compliance with these terms and conditions is not prohibited under the ESA (50 CFR § 402.14(i)(5)). As such, partial compliance with these terms and conditions may invalidate this take exemption and result in unauthorized, prohibited take under the ESA. If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the action may lapse.

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 Permits Division, USACE, or its authorization holder must undertake the following:

1. Implement all mitigation measures, including observation and shut down zones and other requirements, as described in the final IHA and the marine mammal monitoring and mitigation plan.
2. In the event that the proposed action causes serious injury or mortality of a marine mammal (e.g. ship strike, stranding, and/or entanglement), the MOS will immediately

report the incident to NMFS AKR (akr.section7@noaa.gov), Kathleen Leonard (Kathleen.leonard@noaa.gov), and the Marine Mammal Stranding Hotline at 877-925-7773 (Table 3).

3. Following a prohibited take, the NMFS Permits Division and USACE will be required to reinitiate consultation under 50 CFR § 402.16, and any subsequent activities causing incidental take will not be exempt from the take prohibitions of ESA section 9. NMFS AKR will work with the NMFS Permits Division and USACE to determine what is necessary to minimize the likelihood of further prohibited take and ensure ESA compliance.

To carry out RPM #2: NMFS Permits Division, USACE, or its authorization holder must undertake the following:

1. Adhere to all monitoring and reporting requirements as detailed in the IHA issued by NMFS under section 101(a)(5) of the MMPA as reflected in the marine mammal monitoring and mitigation plan.
2. Submit a project specific report within 90 days of the conclusion of in-water work associated with this project. The report must analyze and summarize marine mammal interactions during this project. The report should be emailed to NMFS AKR at AKR.section7@noaa.gov. This report must also contain information described in the mitigation measures of this opinion.

## 11 CONSERVATION RECOMMENDATIONS

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

For this proposed action, NMFS suggests the following conservation recommendations:

1. Project vessel crews should participate in the WhaleAlert program to report real-time sightings of whales while transiting in the waters of Southeast Alaska and to minimize the risk of vessel strikes. More information is available at https://www.fisheries.noaa.gov/resource/tool-app/whale-alert.
2. Without approaching whales, project vessel crews should attempt to photograph humpback whale flukes and record GPS coordinates of the sightings during transit. These data should be included in the final report submitted to NMFS AKR.
3. Without approaching whales, project vessel crews should attempt to photograph and/or video North Pacific right whales and record GPS coordinates of the sightings during transit. These data should be submitted to NMFS AKR as soon as possible.

4. Without approaching sea lions, project vessel crews should attempt to photograph Steller sea lions when brand numbers are visible and record GPS coordinates of the sightings during transit. These data should be included in the final report submitted to NMFS AKR.

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

## 12 REINITIATION OF CONSULTATION

As provided in 50 CFR § 402.16, reinitiation of 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 (50 CFR § 402.14(i)(4)).

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

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

### 13.1 Utility

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

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

## 13.2 Integrity

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

## 13.3 Objectivity

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

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

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

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

# 14 REFERENCES

Ban, S. S. 2005. Modelling and characterization of Steller sea lion haulouts and rookeries using oceanographic and shoreline type data. University of British Columbia, Vancouver, BC.

Barbeaux, S. J., K. Holsman, and S. Zador. 2020. Marine heatwave stress test of ecosystem-based fisheries management in the Gulf of Alaska Pacific Cod Fishery. Frontiers in Marine Science **7**:703.

Barlow, J., and P. J. Clapham. 1997. A new birth-interval approach to estimating demographic parameters of humpback whales. Ecology **78**:535-546.

Bates, N. R., J. T. Mathis, and L. W. Cooper. 2009. Ocean acidification and biologically induced seasonality of carbonate mineral saturation states in the western Arctic Ocean. Journal of Geophysical Research **114**.

Bauer, G., and L. M. Herman. 1986. Effects of vessel traffic on the behavior of humpback whales in Hawaii. Final report to the National Marine Fisheries Service, Honolulu, Hawaii.

Bettridge, S., C. S. Baker, J. Barlow, P. Clapham, M. Ford, D. Gouveia, D. Mattila, R. Pace, P. E. Rosel, G. K. Silber, and P. Wade. 2015. Status review of the humpback whale (*Megaptera novaeangliae*) under the Endangered Species Act. Page 263 p. U.S. Dept. Commer., NOAA, NMFS, SWFSC.

BLM. 2019. Biological Evaluation for the Implementation of the Oil and Gas Lease Sales for the Arctic Wildlife Refuge Coastal Plain. Submitted to NMFS Alaska Region, Anchorage, AK.

Bond, N. A., M. F. Cronin, H. Freeland, and N. Mantua. 2015. Causes and impacts of the 2014 warm anomaly in the NE Pacific. Geophysical Research Letters **42**:3414-3420.

Brower, A. A., J. T. Clarke, and M. C. Ferguson. 2018. Increased sightings of subArctic cetaceans in the eastern Chukchi Sea, 2008–2016: population recovery, response to climate change, or increased survey effort? Polar Biology **41**:1033-1039.

Burek, K. A., F. Gulland, and T. M. O'Hara. 2008. Effects of climate change on Arctic marine mammal health. Ecological Applications **18**:S126-S134.

Burkanov, V. N., and T. R. Loughlin. 2005. Distribution and abundance of Steller sea lions, *Eumetopias jubatus*, on the Asian coast, 1720's-2005. Marine Fisheries Review **67**:1-62.

Burton, W. H. 1993. Effects of bucket dredging on water quality in the Delaware River and the potential for effects on fisheries resources. Prepared for Delaware Basin Fish and Wildlife Management Cooperative.

Calkins, D. G., and E. Goodwin. 1988. Investigation of the declining sea lion population in the Gulf of Alaska. Page 76 p. Alaska Dept. of Fish and Game, Anchorage, AK.

Calkins, D. G., and K. W. Pitcher. 1982. Population assessment, ecology and trophic relationships of Steller sea lions in the Gulf of Alaska. Pages 447-546 Environmental assessment of the Alaska continental shelf. Prepared by the Alaska Department of Fish and Game for the Outer Continental Shelf Environmental Assessment Program, Final Report: Research Unit 243, ACE 8094521, Anchorage, AK.

Call, K. A., and T. R. Loughlin. 2005. An ecological classification of Alaskan Steller sea lion (*Eumetopias jubatus*) rookeries: A tool for conservation/management. Fisheries Oceanography **14**:212-222.

Carretta, J. V., E. M. Oleson, K. A. Forney, M. M. Muto, D. W. Weller, A. R. Lang, J. Baker, B. Hanson, A. J. Orr, J. Barlow, J. E. Moore, and R. L. Brownell, Jr. 2023. Draft U.S. Pacific marine mammal stock assessments: 2022. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla, CA.

Casper, B. M., A. N. Popper, F. Matthews, T. J. Carlson, and M. B. Halvorsen. 2012. Recovery of barotrauma injuries in Chinook salmon, Oncorhynchus tshawytscha from exposure to pile driving sound. PLoS One **7**:e39593.

Cavole, L. M., A. M. Demko, R. E. Diner, A. Giddings, I. Koester, C. M. Pagniello, M.-L. Paulsen, A. Ramirez-Valdez, S. M. Schwenck, and N. K. Yen. 2016. Biological impacts of the 2013–2015 warm-water anomaly in the Northeast Pacific: winners, losers, and the future. Oceanography **29**:273-285.

Chapin, F. S., III, S. F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A. D. McGuire, and M. Serreze. 2014. Ch. 22: Alaska. Pages 514-536 *in* J. M. Melillo, T. C. Richmond, and G. W. Yohe, editors. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program.

Cheng, L., J. Abraham, J. Zhu, K. E. Trenberth, J. Fasullo, T. Boyer, R. Locarnini, B. Zhang, F. Yu, L. Wan, X. Chen, X. Song, Y. Liu, and M. E. Mann. 2020. Record-setting ocean warmth continued in 2019. Advances in Atmospheric Sciences **37**:137-142.

Chu, K., C. Sze, and C. Wong. 1996. Swimming behaviour during the larval development of the shrimp *Metapenaeus ensis* (De Haan, 1844)(Decapoda, Penaeidae). Crustaceana **69**:368-378.

Chumbley, K., J. Sease, M. Strick, and R. Towell. 1997. Field studies of Steller sea lions (*Eumetopias jubatus*) at Marmot Island, Alaska 1979 through 1994. Page 99 p. U.S. Dept. of Commerce, NOAA, NMFS, Alaska Fisheries Science Center, Seattle, WA.

Clapham, P. J. 1992. Age at attainment of sexual maturity in humpback whales, *Megaptera*

*novaeangliae*. Canadian Journal of Zoology **70**:1470-1472.

Clapham, P. J. 1993. Social organization of humpback whales on a North Atlantic feeding ground. Pages 131-145.

Clark, C. W., W. T. Ellison, B. L. Southall, L. Hatch, S. M. Van Parijs, A. Frankel, and D. Ponirakis. 2009. Acoustic masking in marine ecosystems: intuitions, analysis, and implication. Marine Ecology Progress Series **395**:201-222.

Cox, T. M., T. Ragen, A. Read, E. Vos, R. Baird, K. Balcomb, J. Barlow, J. Caldwell, T. Cranford, and L. Crum. 2006. Understanding the impacts of anthropogenic sound on beaked whales. Space and Naval Warfare Systems Center, San Diego, CA.

Crespi, E. J., T. D. Williams, T. S. Jessop, and B. Delehanty. 2013. Life history and the ecology of stress: how do glucocorticoid hormones influence life-history variation in animals? Functional Ecology **27**:93-106.

D'Vincent, C. G., R. M. Nilson, and R. E. Hanna. 1985. Vocalization and coordinated feeding behavior of the humpback whale in southeastern Alaska. Scientific Reports of the Whales Research Institute **36**:41–47.

DeGrandpre, M., W. Evans, M.-L. Timmermans, R. Krishfield, B. Williams, and M. Steele. 2020. Changes in the Arctic Ocean carbon cycle with diminishing ice cover. Geophysical Research Letters **47**:e2020GL088051.

Delean, B. J., V. T. Helker, M. M. Muto, K. Savage, S. Teerlink, L. A. Jemison, K. Wilkinson, J. E. Jannot, and N. C. Young. 2020. Human-caused mortality and injury of NMFS-managed Alaska marine mammal stocks, 2013-2017. Page 86 p *in* S. United States. National Marine Fisheries, C. Alaska Fisheries Science, O. Alaska Regional, R. West Coast, and C. Northwest Fisheries Science, editors. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA.

Doney, S. C., M. Ruckelshaus, J. E. Duffy, J. P. Barry, F. Chan, C. A. English, H. M. Galindo, J. M. Grebmeier, A. B. Hollowed, N. Knowlton, J. Polovina, N. N. Rabalais, W. J. Sydeman, and L. D. Talley. 2012. Climate change impacts on marine ecosystems. Annual Reviews in Marine Science **4**:11-37.

Dunton, K. H., J. L. Goodall, S. V. Schonberg, J. M. Grebmeier, and D. R. Maidment. 2005. Multi-decadal synthesis of benthic–pelagic coupling in the western arctic: role of cross-shelf advective processes. Deep Sea Research Part II: Topical Studies in Oceanography **52**:3462-3477.

Dunton, K. H., S. V. Schonberg, and L. W. Cooper. 2012. Food web structure of the Alaskan nearshore shelf and estuarine lagoons of the Beaufort Sea. Estuaries and Coasts **35**:416-435.

Eisner, L. B., Y. I. Zuenko, E. O. Basyuk, L. L. Britt, J. T. Duffy-Anderson, S. Kotwicki, C. Ladd, and W. Cheng. 2020. Environmental impacts on walleye pollock (*Gadus chalcogrammus*) distribution across the Bering Sea shelf. Deep Sea Research Part II: Topical Studies in Oceanography **181-182**:104881.

Ellison, W., B. Southall, C. Clark, and A. Frankel. 2012. A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds. Conservation Biology **26**:21-28.

Evans, P. G. H., Q. Carson, P. Fisher, W. Jordan, R. Limer, and I. Rees. 1994. A study of the reactions of harbour porpoises to various boats in the coastal waters of southeast Shetland. European Research on Cetaceans **8**:60-64.

Everitt, R. D., C. H. Fiscus, and R. L. DeLong. 1980. Northern Puget Sound marine mammals. Interagency energy/environment R&D Program Report No. EPA 600/7-80-139 prepared by the NOAA NMFS National Marine Mammal Laboratory for the Marine Ecosytems Analysis Puget Sound Project, U.S. Dept. of Commerce and U.S. Environmental Protection Agency, Washington, D.C.

Fabry, V. J., J. B. McClintock, J. T. Mathis, and J. M. Grebmeier. 2009. Ocean acidification at high latitudes: the Bellweather. Oceanography **22**:160-171.

Fabry, V. J., B. A. Seibel, R. A. Feely, and J. C. Orr. 2008. Impacts of ocean acidification on marine fauna and ecosystem processes. ICES Journal of Marine Science **65**:414-432.

Fair, P. A., and P. R. Becker. 2000. Review of stress in marine mammals. Journal of Aquatic Ecosystem Stress and Recovery **7**:335-354.

Fay, V. 2002. Alaska Aquatic Nuisance Species Management Plan. Alaska Department of Fish and Game Publication. Juneau, AK.

Fedewa, E. J., T. M. Jackson, J. I. Richar, J. L. Gardner, and M. A. Litzow. 2020. Recent shifts in northern Bering Sea snow crab (*Chionoecetes opilio*) size structure and the potential role of climate-mediated range contraction. Deep Sea Research Part II: Topical Studies in Oceanography:104878.

Feely, R. A., S. C. Doney, and S. R. Cooley. 2009. Ocean acidification: present conditions and future changes in a high-$CO_2$ world. Oceanography **22**:37-47.

Feely, R. A., C. L. Sabine, K. Lee, W. Berelson, J. Kleypas, V. J. Fabry, and F. J. Millero. 2004. Impact of anthropogenic CO2 on the CaCO3 system in the oceans. Science **305**:362-366.

Ferguson, M. C., C. Curtice, and J. Harrison. 2015. 6. Biologically Important Areas for Cetaceans Within U.S. Waters – Gulf of Alaska Region. Aquatic Mammals **41**:65-78.

Finneran, J. J., R. Dear, D. A. Carder, and S. H. Ridgway. 2003. Auditory and behavioral responses of California sea lions (*Zalophus californianus*) to single underwater impulses

from an arc-gap transducer. Journal of the Acoustical Society of America **114**:1667-1677.

Foote, A. D., R. W. Osborne, and A. R. Hoelzel. 2004. Whale-call response to masking boat noise. Nature **428**:910.

Freed, J. C., N. C. Young, B. J. Delean, V. T. Helker, M. M. Muto, K. M. Savage, S. S. Teerlink, L. A. Jemison, K. M. Wilkinson, and J. E. Jannot. 2022. Human-caused mortality and injury of NMFS-managed Alaska marine mammal stocks, 2016-2020. Page 116 p. U. S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA.

Frid, A., J. Burns, G. G. Baker, and R. E. Thorne. 2009. Predicting synergistic effects of resources and predators on foraging decisions by juvenile Steller sea lions. Oecologia **158**:12.

Frid, A., and L. M. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. Conservation Ecology **6**:11.

Fritz, L., K. Sweeney, D. Johnson, M. Lynn, T. Gelatt, and J. Gilpatrick. 2013. Aerial and ship-based surveys of Steller sea lions (*Eumetopias jubatus*) conducted in Alaska in June-July 2008 through 2012, and an update on the status and trend of the western distinct population segment in Alaska. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center.

Frölicher, T. L., E. M. Fischer, and N. Gruber. 2018. Marine heatwaves under global warming. Nature **560**:360-364.

Geraci, J. R., and D. J. St. Aubin. 1990. Sea Mammals and Oil: Confronting the Risks. Academic Press, Inc., San Deigo, CA.

Gisiner, R. C. 1985. Male territorial and reproductive behavior in the Steller sea lion, *Eumetopias jubatus*. Ph.D. dissertation. University of California, Santa Cruz, CA.

Goldbogen, J. A., J. Calambokidis, D. A. Croll, J. T. Harvey, K. M. Newton, E. M. Oleson, G. Schorr, and R. E. Shadwick. 2008. Foraging behavior of humpback whales: kinematic and respiratory patterns suggest a high cost for a lunge. Journal of Experimental Biology **211**:3712-3719.

Grebmeier, J. M., J. E. Overland, S. E. Moore, E. V. Farley, E. C. Carmack, L. W. Cooper, K. E. Frey, J. H. Helle, F. A. McLaughlin, and S. L. McNutt. 2006. A major ecosystem shift in the northern Bering Sea. Science **311**:1461-1464.

Halvorsen, M. B., B. M. Casper, C. M. Woodley, T. J. Carlson, and A. N. Popper. 2012. Threshold for onset of injury in Chinook salmon from exposure to impulsive pile driving sounds. PLoS One **7**:e38968.

Hansen, D. J. 1985. The Potential Effects of Oil Spills and Other Chemical Pollutants on Marine

Mammals Occurring in Alaskan Waters. USDOI, MMS, Alaska OCS Region, Anchorage, AK.

Hastings, K. K., M. J. Rehberg, G. M. O'Corry-Crowe, G. W. Pendleton, L. A. Jemison, and T. S. Gelatt. 2020. Demographic consequences and characteristics of recent population mixing and colonization in Steller sea lions, *Eumetopias jubatus*. Journal of Mammalogy **101**:107-120.

Hastings, M. C., and A. N. Popper. 2005. Effects of sound on fish. Report prepared by Jones and Stokes under contract with California Department of Transportation, No. 43A0139, Sacramento, CA.

Hawkins, A. D., A. E. Pembroke, and A. N. Popper. 2015. Information gaps in understanding the effects of noise on fishes and invertebrates. Reviews in Fish Biology and Fisheries **25**:39-64.

Helker, V. T., M. M. Muto, K. Savage, S. Teerlink, L. A. Jemison, K. Wilkinson, and J. Jannot. 2019. Human-caused mortality and injury of NMFS-managed Alaska marine mammal stocks, 2012-2016. Page 71 p. U. S. Dept. of Commerce, NOAA, NMFS, Alaska Fisheries Science Center, Seattle, WA.

Hildebrand, J. A. 2009. Anthropogenic and natural sources of ambient noise in the ocean. Marine Ecology Progress Series **395**:5-20.

Hinzman, L. D., N. D. Bettez, W. R. Bolton, F. S. Chapin, M. B. Dyurgerov, C. L. Fastie, B. Griffith, R. D. Hollister, A. Hope, H. P. Huntington, A. M. Jensen, G. J. Jia, T. Jorgenson, D. L. Kane, D. R. Klein, G. Kofinas, A. H. Lynch, A. H. Lloyd, A. D. McGuire, F. E. Nelson, W. C. Oechel, T. E. Osterkamp, C. H. Racine, V. E. Romanovsky, R. S. Stone, D. A. Stow, M. Sturm, C. E. Tweedie, G. L. Vourlitis, M. D. Walker, D. A. Walker, P. J. Webber, J. M. Welker, K. S. Winker, and K. Yoshikawa. 2005. Evidence and implications of recent climate change in northern Alaska and other Arctic regions. Climatic Change **72**:251-298.

Holt, M. M., D. P. Noren, V. Veirs, C. K. Emmons, and S. Veirs. 2009. Speaking up: Killer whales (*Orcinus orca*) increase their call amplitude in response to vessel noise. Journal of the Acoustical Society of America **125**:EL27-EL32.

Houghton, J. 2001. The science of global warming. Interdisciplinary Science Reviews **26**:247-257.

Huntington, H. P., S. L. Danielson, F. K. Wiese, M. Baker, P. Boveng, J. J. Citta, A. De Robertis, D. M. Dickson, E. Farley, and J. C. George. 2020. Evidence suggests potential transformation of the Pacific Arctic ecosystem is underway. Nature Climate Change **10**:342-348.

IPCC. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and

III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva, Switzerland.

IPCC. 2019. Summary for Policymakers. Pages 1-36 *in* H.-O. Pörtner, D. C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, M. Nicolai, A. Okem, J. Petzold, B. Rama, and N. Weyer, editors. IPCC Special Report on the Ocean and Cryosphere in a Changing Climate. Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK and New York, NY.

Isaac, J. L. 2009. Effects of climate change on life history: implications for extinction risk in mammals. Endangered Species Research **7**:115-123.

Jemison, L. A., G. W. Pendleton, L. W. Fritz, K. K. Hastings, J. M. Maniscalco, A. W. Trites, and T. S. Gelatt. 2013. Inter-population movements of Steller sea lions in Alaska with implications for population separation. PLoS One **8**:e70167.

Jessop, T. S., A. D. Tucker, C. J. Limpus, and J. M. Whittier. 2003. Interactions between ecology, demography, capture stress, and profiles of corticosterone and glucose in a free-living population of Australian freshwater crocodiles. General and comparative endocrinology **132**:161-170.

Jiang, L., R. A. Feely, B. R. Carter, D. J. Greeley, D. K. Gledhill, and K. M. Arzayus. 2015. Climatological distribution of aragonite saturation state in the global oceans. Global Biogeochemical Cycles **29**:1656-1673.

Johnson, J. H., and A. A. Wolman. 1984. The Humpback Whale, *Megaptera novaeangliae*. Marine Fisheries Review **46**:300-337.

Kastelein, R. A., L. Hoek, R. Gransier, M. Rambags, and N. Claeys. 2014. Effect of level, duration, and inter-pulse interval of 1-2 kHz sonar signal exposures on harbor porpoise hearing. Journal of the Acoustical Society of America **136**:412-422.

Kastelein, R. A., R. Van Schie, W. C. Verboom, and D. de Haan. 2005. Underwater hearing sensitivity of a male and a female Steller sea lion (*Eumetopias jubatus*). Journal of the Acoustical Society of America **118**:1820-1829.

Keple, A. R. 2002. Seasonal abundance and distribution of marine mammals in the southern Strait of Georgia, British Columbia. University of British Columbia.

Ketten, D. R. 1997. Structure and function in whale ears. Bioacoustics **8**:103-135.

Kight, C. R., and J. P. Swaddle. 2011. How and why environmental noise impacts animals: an integrative, mechanistic review. Ecology Letters **14**:1052-1061.

Konar, B., T. J. Mitchell, K. Iken, H. Coletti, T. Dean, D. Esler, M. Lindeberg, B. Pister, and B. Weitzman. 2019. Wasting disease and static environmental variables drive sea star assemblages in the Northern Gulf of Alaska. Journal of Experimental Marine Biology

and Ecology **520**:151209.

Kruse, S. 1991. The interactions between killer whales and boats in Johnstone Strait, B.C.*in* K. Pryor and K. Norris, editors. Dolphin Societies - Discoveries and Puzzles. University of California Press, Berkeley, California.

Kryter, K. D. 1970. The effects of noise on man. Academic Press, Inc., New York.

Kryter, K. D. 1985. The handbook of hearing and the effects of noise, 2nd edition. Academic Press, Orlando, FL.

Kucey, L. 2005. Human disturbance and the hauling out behavior of steller sea lions (*Eumetopias jubatus*). University of British Columbia, British Columbia.

Laist, D. W., A. R. Knowlton, J. G. Mead, A. S. Collet, and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science **17**:35-75.

Lambertsen, R. H. 1992. Crassicaudosis: a parasitic disease threatening the health and population recovery of large baleen whales. Rev. Sci. Technol., Off. Int. Epizoot. **11**:1131-1141.

Lankford, S., T. Adams, R. Miller, and J. Cech Jr. 2005. The cost of chronic stress: impacts of a nonhabituating stress response on metabolic variables and swimming performance in sturgeon. Physiological and Biochemical Zoology **78**:599-609.

Learmonth, J. A., C. D. Macleod, M. B. Santos, G. J. Pierce, H. Q. P. Crick, and R. A. Robinson. 2006. Potential effects of climate change on marine mammals. Oceanography and Marine Biology: An Annual Review **44**:431-464.

Lefebvre, K. A., L. Quakenbush, E. Frame, K. B. Huntington, G. Sheffield, R. Stimmelmayr, A. Bryan, P. Kendrick, H. Ziel, T. Goldstein, J. A. Snyder, T. Gelatt, F. Gulland, B. Dickerson, and V. Gill. 2016. Prevalence of algal toxins in Alaskan marine mammals foraging in a changing arctic and subarctic environment. Harmful Algae **55**:13-24.

Lischka, S., and U. Riebesell. 2012. Synergistic effects of ocean acidification and warming on overwintering pteropods in the Arctic. Global Change Biology **18**:3517-3528.

Loughlin, T. R. 2002. Steller's sea lion *Eumetopias jubatus*. Pages 1181-1185 *in* W. F. Perrin, B. Würsig, and J. G. M. Thewissen, editors. Encyclopedia of Marine Mammals. Academic Press, San Diego.

Loughlin, T. R., D. J. Rugh, and C. H. Fiscus. 1984. Northern sea lion distribution and abundance: 1956-80. Journal of Wildlife Management **48**:729-740.

Lowry, D., S. Wright, M. Neuman, D. Stevenson, J. Hyde, M. R. Lindeberg, N. Tolimieri, S. Lonhart, S. B. Traiger, and R. G. Gustafson. 2022. Draft Endangered Species Act status review report: sunflower sea star (*Pycnopodia helianthoides*). Page 89 p. + appendices. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National

Marine Fisheries Service, Seattle, WA.

Lusseau, D. 2003. Effects of tour boats on the behavior of bottlenose dolphins: Using Markov chains to model anthropogenic impacts. Conservation Biology **17**:1785-1793.

Lusseau, D. 2006. The short-term behavioral reactions of bottlenose dolphins to interactions with boats in Doubtful Sound, New Zealand. Marine Mammal Science **22**:802-818.

Lüthi, D., M. Le Floch, B. Bereiter, T. Blunier, J.-M. Barnola, U. Siegenthaler, D. Raynaud, J. Jouzel, H. Fischer, K. Kawamura, and T. F. Stocker. 2008. High-resolution carbon dioxide concentration record 650,000–800,000 years before present. Nature **453**:379-382.

Macleod, C. D. 2009. Global climate change, range changes and potential implications for the conservation of marine cetaceans: A review and synthesis. Endangered Species Research **7**:125-136.

McCarthy, J. J., O. Canziani, N. A. Leary, D. J. Dokken, and K. S. White. 2001. Climate change 2001: Impacts, adaptation, and vulnerability. Contribution of working group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom.

McCauley, R. D., J. Fewtrell, and A. N. Popper. 2003. High intensity anthropogenic sound damages fish ears. The Journal of the Acoustical Society of America **113**:638-642.

Merrick, R. L., and T. R. Loughlin. 1997. Foraging behavior of adult female and young-of-the-year Steller sea lions in Alaskan waters. Canadian Journal of Zoology **75**:776-786.

Moberg, G. P. 2000. Biological response to stress: Implications for animal welfare. Pages 1-21 *in* G. P. Moberg and J. A. Mench, editors. The Biology of Animal Stress: Basic Principles and Implications for Animal Welfare. CABI Publishing, Oxon, United Kingdom.

Morete, M. E., T. L. Bisi, and S. Rosso. 2007. Mother and calf humpback whale responses to vessels around the Abrolhos Archipelago, Bahia, Brazil. Journal of Cetacean Research and Management **9**:241-248.

Morton, A., and H. K. Symonds. 2002. Displacement of *Orcinus orca* (L.) by high amplitude sound in British Columbia, Canada. ICES Journal of Marine Science **59**:71-80.

Motti, C. A., U. Bose, R. E. Roberts, C. McDougall, M. K. Smith, M. R. Hall, and S. F. Cummins. 2018. Chemical ecology of chemosensation in Asteroidea: insights towards management strategies of pest species. Journal of chemical ecology **44**:147-177.

Mueter, F. J., C. Broms, K. F. Drinkwater, K. D. Friedland, J. A. Hare, G. L. Hunt Jr, W. Melle, and M. Taylor. 2009. Ecosystem responses to recent oceanographic variability in high-latitude Northern Hemisphere ecosystems. **81**:18.

Mulsow, J., and C. Reichmuth. 2010. Psychophysical and electrophysiological aerial audiograms

of a Steller sea lion (Eumetopias jubatus). The Journal of the Acoustical Society of America **127**:2692-2701.

Muto, M. M., V. T. Helker, B. J. Delean, N. C. Young, J. C. Freed, R. P. Angliss, N. A. Friday, P. L. Boveng, J. M. Breiwick, B. M. Brost, M. F. Cameron, P. J. Clapham, J. L. Crance, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, K. T. Goetz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Shelden, K. L. Sweeney, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini. 2021. Alaska marine mammal stock assessments, 2020. Page 398 p. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA.

Neff, J. M. 1990. Composition and Fate of Petroleum and Spill-Treating Agents in the Marine Environment. Pages 1-33 *in* J. R. Geraci and D. J. St. Aubin, editors. Sea Mammals and Oil: Confronting the Risks. Academic Press, New York, NY.

Neilson, J., C. Gabriele, J. Straley, S. Hills, and J. Robbins. 2005. Humpback whale entanglement rates in southeast Alaska. Pages 203-204 Sixteenth Biennial Conference on the Biology of Marine Mammals, San Diego, California.

Neilson, J. L., and C. Gabriele. 2020. Glacier Bay and Icy Strait humpback whale population monitoring: 2019 update. National Park Service Resource Brief, Gustavus, AK.

Neilson, J. L., C. M. Gabriele, A. S. Jensen, K. Jackson, and J. M. Straley. 2012. Summary of reported whale-vessel collisions in Alaskan waters. Journal of Marine Biology **2012**:Article ID 106282.

NMFS. 2008a. Conservation Plan for the Cook Inlet beluga whale (*Delphinapterus leucas*). Page 122 p. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service Alaska Region, Protected Resources Division, Juneau, AK.

NMFS. 2008b. Recovery plan for the Steller sea lion (*Eumetopias jubatus*). Eastern and Western Distinct Population Segments (*Eumetopias jubatus*). Revision. Page 325 p. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, MD.

NMFS. 2018a. Assessment of the Pacific cod stock in the Gulf of Alaska.*in* N. Department of Commerce, editor. Alaska Fisheries Science Center, Seattle, WA.

NMFS. 2018b. Revision to technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 2.0): underwater acoustic thresholds for onset of permanent and temporary threshold shifts. Page 178 p. U.S. Dept. of Commerce, National Oceanic and Atmospherica Administraiton, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD.

NMFS. 2019. Endangered Species Act Section 7(a)(2) Biological Opinion Taiya Inlet Railroad Dock Dolphin Project, Skagway, Alaska. U.S. Dept. of Commerce, NOAA, National Marine Fisheries Service, Alaska Region Protected Resources Division, Juneau, Alaska.

NMFS. 2020. 5-year review: summary and evaluation of western Distinct Population Segment Steller sea lion *Eumetopias jubatus*. Page 61 p. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Region, Protected Resources Division, Juneau, AK.

Nowacek, D. P., L. H. Thorne, D. W. Johnston, and P. L. Tyack. 2007. Responses of cetaceans to anthropogenic noise. Mammal Review **37**:81-115.

NRC. 2003. Ocean Noise and Marine Mammals. National Research Council, Ocean Study Board, National Academy Press, Washington, D.C.

Orr, J. C., V. J. Fabry, O. Aumont, L. Bopp, S. C. Doney, R. A. Feely, A. Gnanadesikan, N. Gruber, A. Ishida, F. Joos, R. M. Key, K. Lindsay, E. Maier-Reimer, R. Matear, P. Monfray, A. Mouchet, R. G. Najjar, G.-K. Plattner, K. B. Rodgers, C. L. Sabine, J. L. Sarmiento, R. Schlitzer, R. D. Slater, I. J. Totterdell, M.-F. Weirig, Y. Yamanaka, and A. Yool. 2005. Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms. Nature **437**:681-686.

Payne, R. S. 1970. Songs of the humpback whale. Capitol Records, Hollywood, CA.

Pearson, W. H., J. R. Skalski, and C. I. Malme. 1992. Effects of sounds from a geophysical survey device on behavior of captive rockfish (Sebastes spp.). Canadian Journal of Fisheries and Aquatic Sciences **49**:1343-1356.

Perry, S. L., D. P. DeMaster, and G. K. Silber. 1999. The Great Whales: History and Status of Six Species Listed as Endangered Under the U.S. Endangered Species Act of 1973: a special issue of the Marine Fisheries Review. Marine Fisheries Review **61**:1-74.

Petersen, S., A. Krätschell, N. Augustin, J. Jamieson, J. R. Hein, and M. D. Hannington. 2016. News from the seabed – Geological characteristics and resource potential of deep-sea mineral resources. Marine Policy **70**:175-187.

Peterson, W., N. Bond, and M. Robert. 2016. The blob (part three): Going, going, gone? PICES Press **24**:46.

Pitcher, K. W., and D. G. Calkins. 1981. Reproductive biology of Steller sea lions in the Gulf of Alaska. Journal of Mammalogy **62**:599-605.

Pitcher, K. W., and F. H. Fay. 1982. Feeding by Steller sea lions on harbor seals. The Murrelet:70-71.

Pitcher, K. W., P. F. Olesiuk, R. F. Brown, M. S. Lowry, S. J. Jeffries, J. L. Sease, W. L. Perryman, C. E. Stinchcomb, and L. F. Lowry. 2007. Abundance and distribution of the

eastern North Pacific Steller sea lion (*Eumetopias jubatus*) population. Fishery Bulletin **107**:102-115.

Popper, A., T. Carlson, B. Casper, and M. Halvorsen. 2014a. Does man-made sound harm fishes. Journal of Ocean Technology **9**:11-20.

Popper, A. N., and A. D. Hawkins. 2019. An overview of fish bioacoustics and the impacts of anthropogenic sounds on fishes. Journal of Fish Biology **94**:692-713.

Popper, A. N., A. D. Hawkins, R. R. Fay, D. A. Mann, S. Bartol, T. J. Carlson, S. Coombs, W. T. Ellison, R. L. Gentry, and M. B. Halvorsen. 2014b. ASA S3/SC1. 4 TR-2014 Sound exposure guidelines for fishes and sea turtles: a technical report prepared by ANSI-Accredited standards committee S3/SC1 and registered with ANSI. Springer.

Qi, D., L. Chen, B. Chen, Z. Gao, W. Zhong, Richard A. Feely, Leif G. Anderson, H. Sun, J. Chen, M. Chen, L. Zhan, Y. Zhang, and W.-J. Cai. 2017. Increase in acidifying water in the western Arctic Ocean. Nature Climate Change **7**:195-199.

Radford, C., J. Stanley, C. Tindle, J. Montgomery, and A. Jeffs. 2010. Localised coastal habitats have distinct underwater sound signatures. Marine Ecology Progress Series **401**:21-29.

Raum-Suryan, K. L., K. W. Pitcher, D. G. Calkins, J. L. Sease, and T. R. Loughlin. 2002. Dispersal, rookery fidelity, and metapopulation structure of Steller sea lions (*Eumetopias jubatus*) in an increasing and a decreasing population in Alaska. Marine Mammal Science **18**:746-764.

Rea, L. D., J. M. Castellini, L. Correa, B. S. Fadely, and T. M. O'Hara. 2013. Maternal Steller sea lion diets elevate fetal mercury concentrations in an area of population decline. Science of The Total Environment **454-455**:277-282.

Reisdorph, S. C., and J. T. Mathis. 2014. The dynamic controls on carbonate mineral saturation states and ocean acidification in a glacially dominated estuary. Estuarine, Coastal and Shelf Science **144**:8-18.

Rice, D. W. 1998. Marine mammals of the world: systematics and distribution. Society for Marine Mammology, Lawrence, KS.

Richardson, W. J., C. R. Greene Jr, C. I. Malme, and D. H. Thomson. 1995. Marine mammals and noise. Academic Press, Inc., San Diego, CA.

Richardson, W. J., and C. I. Malme. 1993. Man-made noise and behavioral responses. Pages 631-700 *in* J. J. Burns, J. J. Montague, and C. J. Cowles, editors. The Bowhead Whale. Society for Marine Mammology, Allen Press, Inc., Lawrence, KS.

Richter-Menge, J., M. L. Druckenmiller, and M. Jeffries, editors,. 2019. Arctic Report Card 2019. http://www.arctic.noaa.gov/Report-Card.

Richter-Menge, J., J. E. Overland, J. T. Mathis, E. Osborne, and Eds.;. 2017. Arctic Report Card 2017, http://www.arctic.noaa.gov/Report-Card.

Ridgway, S. H., D. A. Carder, R. R. Smith, T. Kamolnick, C. E. Schlunt, and W. R. Elsberry. 1997. Behavioural responses and temporary shift in masked hearing threshold of bottlenose dolphins, *Tursiops truncatus*, to 1-second tones of 141 to 201 dB re 1 mPa. Naval Command, Control and Surveillance Center, RDT&E Division, San Diego, California.

Rolland, R. M., S. E. Parks, K. E. Hunt, M. Castellote, P. J. Corkeron, D. P. Nowacek, S. K. Wasser, and S. D. Kraus. 2012. Evidence that ship noise increases stress in right whales. Proceedings of the Royal Society B: Biological Sciences **279**:2363-2368.

Romano, T. A., D. L. Felten, S. Y. Stevens, J. A. Olschowka, V. Quaranta, and S. H. Ridgway. 2002. Immune response, stress, and environment: Implications for cetaceans. Pages 253-279 *in* C. J. Pfeiffer, editor. Molecular and Cell Biology of Marine Mammals. Krieger Publishing Co., Malabar, FL.

Sandegren, F. E. 1970. Breeding and maternal behavior of the Steller sea lion (*Eumetopias jubata*) in Alaska. University of Alaska, Fairbanks, AK.

Schoeman, R. P., C. Patterson-Abrolat, and S. Plon. 2020. A global review of vessel collisions with marine animals. Frontiers in Marine Science **7**:25.

Serreze, M. C., and R. G. Barry. 2011. Processes and impacts of Arctic amplification: a research synthesis. Global and Planetary Change **77**:85-96.

Sharpe, F. A., and L. M. Dill. 1997. The behavior of Pacific herring schools in response to artificial humpback whale bubbles. Canadian Journal of Zoology-Revue Canadienne De Zoologie **75**:725-730.

Silber, G. K. 1986. The relationship of social vocalizations to surface behavior and aggression in the Hawaiian humpback whale (*Megaptera novaeangliae*). Canadian Journal of Zoology **64**:2075-2080.

Simon, M., M. Johnson, and P. T. Madsen. 2012. Keeping momentum with a mouthful of water: behavior and kinematics of humpback whale lunge feeding. Journal of Experimental Biology **215**:3786-3798.

Skalski, J. R., W. H. Pearson, and C. I. Malme. 1992. Effects of sounds from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (Sebastes spp.). Canadian Journal of Fisheries and Aquatic Sciences **49**:1357-1365.

Solé, M., K. Kaifu, T. A. Mooney, S. L. Nedelec, F. Olivier, A. N. Radford, M. Vazzana, M. A. Wale, J. M. Semmens, S. D. Simpson, G. Buscaino, A. D. Hawkins, N. Aguilar de Soto, T. Akamatsu, L. Chauvaud, R. D. Day, Q. Fitzgibbon, R. D. McCauley, and M. André. 2023. Marine invertebrates and noise. Frontiers in Marine Science **10:1129057**.

Southall, B. L., A. E. Bowles, W. T. Ellison, J. J. Finneran, R. L. Gentry, C. R. Greene Jr., D. Kastak, D. R. Ketten, J. H. Miller, P. E. Nachtigall, W. J. Richardson, J. A. Thomas, and P. L. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals **33**:411-521.

Spalding, D. J. 1964. Comparative feeding habits of the fur seal, sea lion and harbour seal on the British Columbia coast. Page 52 p. Bulletin of the Fisheries Research Board of Canada No. 146, Ottawa, Ontario.

Steiger, G. H., J. Calambokidis, J. M. Straley, L. M. Herman, S. Cerchio, D. R. Salden, J. Urban-R., J. K. Jacobsen, O. von Ziegesar, K. C. Balcomb, C. M. Gabriele, M. E. Dahlheim, S. Uchida, J. K. B. Ford, P. Ladron de Guevara-P., M. Yamaguchi, and J. Barlow. 2008. Geographic variation in killer whale attacks on humpback whales in the North Pacific: Implications for predation pressure. Endangered Species Research **4**:247-256.

Straley, J. M., J. R. Moran, K. M. Boswell, J. J. Vollenweider, R. A. Heintz, T. J. Quinn Ii, B. H. Witteveen, and S. D. Rice. 2018. Seasonal presence and potential influence of humpback whales on wintering Pacific herring populations in the Gulf of Alaska. Deep Sea Research Part II: Topical Studies in Oceanography **147**:173-186.

Stroeve, J., M. M. Holland, W. Meier, T. Scambos, and M. Serreze. 2007. Arctic sea ice decline: Faster than forecast. Geophysical Research Letters **34**.

Stroeve, J., and D. Notz. 2018. Changing state of Arctic sea ice across all seasons. Environmental Research Letters **13**:103001.

Suryan, R. M., M. L. Arimitsu, H. A. Coletti, R. R. Hopcroft, M. R. Lindeberg, S. J. Barbeaux, S. D. Batten, W. J. Burt, M. A. Bishop, J. L. Bodkin, R. Brenner, R. W. Campbell, D. A. Cushing, S. L. Danielson, M. W. Dorn, B. Drummond, D. Esler, T. Gelatt, D. H. Hanselman, S. A. Hatch, S. Haught, K. Holderied, K. Iken, D. B. Irons, A. B. Kettle, D. G. Kimmel, B. Konar, K. J. Kuletz, B. J. Laurel, J. M. Maniscalco, C. Matkin, C. A. E. McKinstry, D. H. Monson, J. R. Moran, D. Olsen, W. A. Palsson, W. S. Pegau, J. F. Piatt, L. A. Rogers, N. A. Rojek, A. Schaefer, I. B. Spies, J. M. Straley, S. L. Strom, K. L. Sweeney, M. Szymkowiak, B. P. Weitzman, E. M. Yasumiishi, and S. G. Zador. 2021. Ecosystem response persists after a prolonged marine heatwave. Scientific Reports **11**:6235.

Sweeney, K., L. Fritz, R. Towell, and T. Gelatt. 2017. Results of Steller sea lion surveys in Alaska, June-July 2017. Memorandum to the Record, December 5, 2017.*in* National Marine Fisheries Service Alaska Fisheries Science Center, editor.

Sweeney, K., R. Towell, and T. Gelatt. 2018. Results of Steller Sea Lion Surveys in Alaska, June-July 2018: Memorandum to The Record. U.S. Dept. of Commerce, NOAA, NMFS, Alaska Fisheries Science Center, Marine Mammal Laboratory, Seattle, WA. December 4, 2018.

Thoman, R., and J. Walsh. 2019. Alaska's Changing Environment: documenting Alaska's physical and biological changes through observations., International Arctic Research Center, University of Alaska Fairbanks.

Thompson, P. O., W. C. Cummings, and S. J. Ha. 1986. Sounds, source levels, and associated behavior of humpback whales, Southeast Alaska. Journal of the Acoustical Society of America **80**:735-740.

Thompson, T. J., H. E. Winn, and P. J. Perkins. 1979. Mysticete sounds. Pages 403-431 *in* H. E. Winn and B. L. Olla, editors. Behavior of Marine Animals: Current Perspectives in Research Vol. 3: Cetaceans. Plenum Press, New York, NY.

Thorson, P., and J. Reyff. 2006. San Francisco-Oakland Bay bridge east span seismic safety project marine mammals and acoustic monitoring for the marine foundations at piers E2 and T1, January-September 2006. Prepared by SRS Technologies and Illingworth & Rodkin, Inc. for the California Department of Transportation: 51 p.

Tomilin, A. 1967. Mammals of the USSR and adjacent countries. Cetacea **9**:666-696.

Traiger, S. B., J. L. Bodkin, H. A. Coletti, B. Ballachey, T. Dean, D. Esler, K. Iken, B. Konar, M. R. Lindeberg, and D. Monson. 2022. Evidence of increased mussel abundance related to the Pacific marine heatwave and sea star wasting. Marine Ecology **43**:e12715.

Tyack, P., and H. Whitehead. 1983. Male competition in large groups of wintering humpback whales. Behaviour **83**:132-154.

Tyack, P. L. 1981. Interactions between singing Hawaiian humpback whales and conspecifics nearby. Behavioral Ecology and Sociobiology **8**:105-116.

Vanderlaan, A. S. M., and C. T. Taggart. 2007. Vessel collisions with whales: the probability of lethal injury based on vessel speed. Marine Mammal Science **23**:144-156.

Wade, P. R. 2021. Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas. National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA.

Wartzok, D., A. N. Popper, J. Gordon, and J. Merrill. 2003. Factors Affecting the Responses of Marine Mammals to Acoustic Disturbance. Marine Technology Society Journal **37**:6-15.

Weilgart, L. S. 2007. A brief review of known effects of noise on marine mammals. International Journal of Comparative Psychology **20**:159-168.

Wiese, K. 1996. Sensory capacities of euphausiids in the context of schooling. Marine and Freshwater Behaviour and Physiology **28**:183-194.

Wieting, D. S. 2016. Interim Guidance on the Endangered Species Act Term "Harass". U.S. Dept. of Commerce, NOAA, NMFS, Office of Protected Resources, Silver Spring, MD.

Wild, L. A., H. E. Riley, H. C. Pearson, C. M. Gabriele, J. L. Neilson, A. Szabo, J. Moran, J. M. Straley, and S. DeLand. 2023. Biologically Important Areas II for cetaceans within U.S. and adjacent waters–Gulf of Alaska region. Frontiers in Marine Science **10**:763.

Williams, R., D. E. Bain, J. K. B. Ford, and A. W. Trites. 2002. Behavioural responses of male killer whales to a 'leapfrogging' vessel. Journal of Cetacean Research and Management **4**:305-310.

Winn, H. E., P. J. Perkins, and T. C. Poulter. 1970. Sounds of the humpback whale. Pages 39-52 7th Annual Conference on Biological Sonar and Diving Mammals, Stanford Research Institute, Menlo Park.

Womble, J. N., M. F. Willson, M. F. Sigler, B. P. Kelley, and G. R. VanBlaricom. 2005. Distribution of Steller sea lion *Eumetopias jubatus* in relation to spring-spawning fish in SE Alaska. Marine Ecology Progress Series **294**:271-282.

WP&YR. 2019. White Pass & Yukon Route Railroad dock dolphin installation: protected species final report. Monitoring report for NMFS Alaska Region Protected Resources Division for compliance with ESA Section 7 consultation AKR0-2018-00261.

Yamamoto, A., M. Kawamiya, A. Ishida, Y. Yamanaka, and S. Watanabe. 2012. Impact of rapid sea-ice reduction in the Arctic Ocean on the rate of ocean acidification. Biogeosciences **9**:2365-2375.

Young, N. C., B. J. Delean, V. T. Helker, J. C. Freed, M. M. Muto, K. Savage, S. Teerlink, L. A. Jemison, K. Wilkinson, and J. E. Jannot. 2020. Human-caused mortality and injury of NMFS-managed Alaska marine mammal stocks, 2014-2018. Page 142 p *in* S. United States. National Marine Fisheries, C. Alaska Fisheries Science, O. Alaska Regional, R. West Coast, and C. Northwest Fisheries Science, editors. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center.

Young, N. C., M. M. Muto, V. T. Helker, B. J. Delean, J. C. Freed, R. P. Angliss, N. A. Friday, P. L. Boveng, J. M. Breiwick, B. M. Brost, M. F. Cameron, P. J. Clapham, J. L. Crance, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, K. T. Goetz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Shelden, K. L. Sweeney, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini. 2022. Draft Alaska marine mammal stock assessments, 2022. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA.