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 and Conference Opinion
Cordova Harbor Rebuild Project
NMFS Consultation Number: AKRO-2023-01396

Action Agencies: National Marine Fisheries Service (NMFS), Office of Protected Resources, Permits and Conservation Division; U.S. Department of Transportation, Maritime Administration (MARAD)

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, Western North Pacific DPS (*Megaptera novaeangliae*)	Endangered	No	No	No	No
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	No	No	No	No
Fin Whale (*Balaenoptera physalus*)	Endangered	No	N/A	No	N/A
Sunflower Sea Star (*Pycnopodia helianthoides*)	Proposed Threatened	Yes	N/A	No	N/A

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By:
Jonathan M. Kurland
Regional Administrator

Date: September 28, 2023

Accessibility of this Document

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TERMS AND ABBREVIATIONS

µPa	Micro Pascal
AKR	Alaska Region
ARBO	Arctic Regional Biological Opinion
ASLC	Alaska SeaLife Center
BA	Biological Assessment
CI	Confidence Interval
CSEL	Cumulative Sound Exposure Level
Cui	Cubic Inches
CV	Coefficient of Variance
CWA	Clean Water Act
dB re 1µPa	Decibel referenced 1 microPascal
District Court	U.S. District Court for the District of Alaska
DPS	Distinct Population Segment
EEZ	Exclusive Economic Zone
EPA	Environmental Protection Agency
ESA	Endangered Species Act
°F	Fahrenheit
FR	Federal Register
ft	Feet
g	Gallons
HTL	High Tide Line
Hz	Hertz
IHA	Incidental Harassment Authorization
IPCC	Intergovernmental Panel on Climate Change
ITA	Incidental Take Authorization
ITS	Incidental Take Statement
IWC	International Whaling Commission
kHz	Kilohertz
km	Kilometers
kn	Knots
L	Liter
m	Meter
MARAD	U.S. Department of Transportation, Maritime Administration

mi	Mile
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
ms	Milliseconds
µPa	Micro Pascal
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRC	National Research Council
NSF	National Science Foundation
Opinion	Biological Opinion
Pa	Pascals
PR1	NMFS Permits Division
PTS	Permanent Threshold Shift
RMS	Root Mean Square
RPA	Reasonable and Prudent Alternative
s	Second
SEL	Sound Exposure Level
SPLASH	Structure of Populations, Level of Abundance and Status of Humpback Whales
SSL	Steller Sea Lion
TTS	Temporary Threshold Shift
VMS	Vessel Monitoring System

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.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions will not be any different. New proposed rules were published in the *Federal Register* on June 22, 2023 (88 FR 40753).

In this document, the action agency is the U.S. Department of Transportation, Maritime Administration (MARAD), which proposes to complete overdue repairs and necessary enhancements to the City of Cordova Harbor. 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 February 2023 Biological Assessment (BA) and subsequent revisions, and the Incidental Harassment Application (IHA) and subsequent revisions prepared and submitted by Solstice Consulting. A complete record of this consultation is on file at NMFS's Alaska Regional Office.

The proposed action involves the repair and enhancement to the City of Cordova Harbor, to be completed in two phases, with an expected start in September 2023 and expected completion in April 2025. The phase I construction window is approximately 280 hours of in-water work over 95 days. The phase II construction window is approximately 815 hours of in-water work over 165 days.

Figure 1. Cordova Harbor (USFS Alaska Region 2006).

This opinion considers the effects of the following in-water activities:

1. demolition of the existing harbor structures,
2. excavating for the breakwater area,

3. removal of existing piles,
4. material excavation,
5. bulkhead and float pile installation,
6. fill placement, and
7. support and material supply vessel transit.

Additionally this opinion considers the effects of the associated proposed issuance of an IHA on the endangered western distinct population segment (DPS) Steller sea lion (*Eumetopias jubatus*) and associated critical habitat, threatened Mexico DPS (*Megatera novaeangliae*) and associated critical habitat, endangered Western North Pacific DPS humpback whale and associated habitat, and endangered fin whale (*Balaenoptera physalus*).

In addition, the action agency requested a discretionary conference on the proposed listing of the sunflower sea star (88 FR 16212, March 16, 2023) in the consultation. In the event the sunflower sea star is listed, this opinion includes analysis of the species similar to that of listed species. This will allow the opinion to remain valid.

1.1.1 Consultation History

- March 13, 2022- NMFS Alaska Region (AKR) received an email from Solstice Alaska Consulting, Inc. (Solstice) requesting technical assistance on the Cordova Harbor Project
- April 4, 2022- NMFS AKR received a request for concurrence on a US Army Corps of Engineers (USACE) permit for geotechnical and geophysical surveys during pre-design work on the project
- June 1, 2022- NMFS AKR issued an expedited Letter of Concurrence (LOC) to USACE for the geotechnical and geophysical surveys
- January 24, 2023- NMFS AKR received a letter from MARAD designating Solstice as their non-federal representative
- February 14, 2023- NMFS AKR received the Biological Assessment (BA) prepared by Solstice from MARAD; NMFS Permits Division (PR1) received an Incidental Harassment Authorization (IHA) application for the project
- February 27, 2023- NMFS AKR received a revision to the BA from Solstice
- March 21, 2023- NMFS AKR received a request from MARAD to provide a written determination of completeness for the BA and concurrence that the BA was sufficient to support development of a Biological Opinion (Opinion). This was in order to help support funding through the NEPA process.
- March 28, 2023- NMFS AKR submitted comments and questions to Solstice on the BA
- March 31, 2023- NMFS AKR met with Solstice, MARAD and PR1 to discuss the proposed listing of the sunflower sea star
- April 28, 2023- Early Review Team (ERT), with participants from NMFS AKR and PR1 met to discuss the project
- May 23, 2023- NMFS AKR submitted and email to MARAD confirming that the BA was complete, and that formal initiation of the joint consultation will start on the date that

NMFS AKR received a concurrent request from PR1
- June 8, 2023- NMFS AKR received a revision to the BA from Solstice
- July 6, 2023- the IHA application was forwarded to NMFS AKR
- July 14, 2023- Proposed IHA published in the Federal Register; NMFS AKR received a request for consultation from PR1; consultation initiated

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 City of Cordova's construction enhancements and operation of the city harbor, funded by MARAD, permitted by USACE, as well as PR1 issuance of an IHA to take marine mammals by harassment under the Marine Mammal Protection Act (MMPA) incidental to these actions in Orca Inlet near Cordova, AK. The construction will take place in two phases. The first phase will take place from September 1, 2023 to August 31, 2024, and the second from September 1, 2024 to August 31, 2025 (Figures 2 and 3).

2.1.1 Proposed Activities

The City of Cordova is located in Orca Inlet within Prince William Sound. The purpose of this project is to remove old structures in the harbor and replace them with new structures, which will improve the safety of the harbor and allow the harbor to better accommodate the commercial fishing industry.

Phase I will involve the removal of existing piles, the installation and removal of temporary piles, and the installation of permanent piles in the South Harbor (Figure 2). During Phase I, 130 timber (12 inch (in) diameter; 0.3 meters (m)) and 61 old steel (12 in diameter; 0.3 m) piles will be removed. Once the existing piles are removed, 155 16-in (0.4 m), 70 18-in (0.5 m), and 30 30-in (0.8 m) permanent steel piles will be installed. The installation and removal of 61 temporary 24-in (0.6 m) steel pipe piles will be completed to support permanent pile installation. Vibratory hammers, impact hammers, and DTH drilling will be used for the installation and removal of all piles (Table 1). Piles will be removed by dead-pull or vibratory methods. The installation and removal of temporary piles will be conducted using vibratory hammers. All permanent piles will be initially installed with a vibratory hammer. After vibratory driving, if needed, piles will be impacted into the bedrock with an impact hammer. For some piles, a DTH drill will be needed to drive piles the final few inches of embedment.

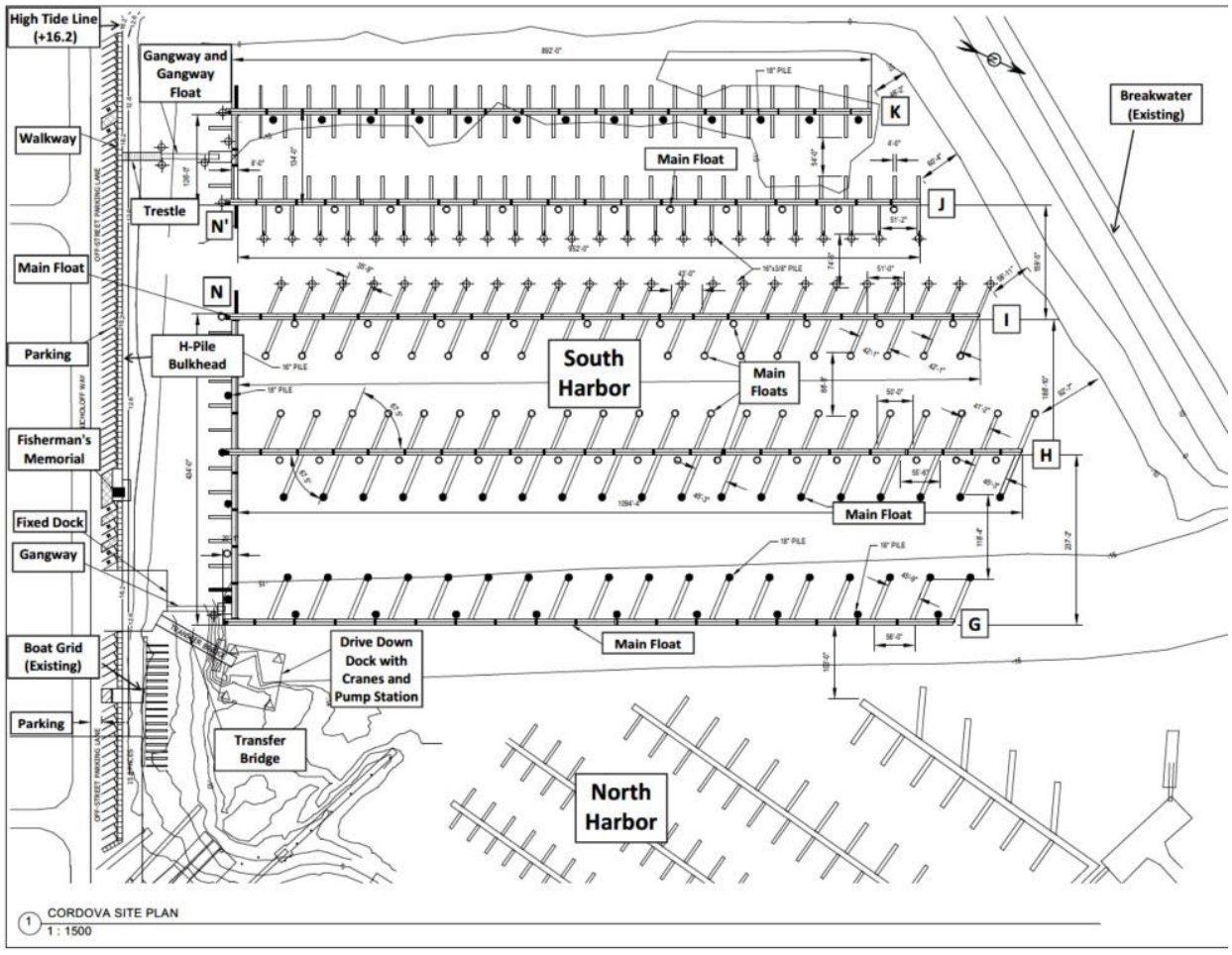

Figure 2. Cordova Harbor Rebuild Project South Harbor Phase I (Solstice 2023).

Table 1. Summary of Pile Removal and Installation Activities for Phase I.

	Perm Pile Removal		**Temp Pile Installation**	**Temp Pile Removal**	**Perm Pile Installation**		
Diameter of Piles (inches)	12	12	24	24	16	18	30
Pile Type	Timber	Steel	Steel	Steel	Steel	Steel	Steel
Total Number of Piles	130	61	61	61	155	70	30
Vibratory Pile Driving							
Total Quantity	130	61	61	61	155	70	30
Max No. Piles Vibrated Per Day	25	25	6	10	10	10	6
Vibratory Time Per Pile (minutes)	10	10	10	10	15	20	30
Vibratory Time Per Day (hours)	4.2	4.2	1.0	1.7	2.5	3.3	3.0
Number of Days	5.2	2.4	10.2	6.1	15.5	7.0	5.0
Total Vibratory Time (hours)	21.7	10.2	10.2	10.2	38.8	23.3	15.0
Impact Pile Driving							
Total Quantity	-	-	-	-	73	35	20
Max No. Piles Impacted Per Day	-	-	-	-	6	6	6
Number Strikes Per Pile	-	-	-	-	240	240	360
Impact Time Per Pile (minutes)	-	-	-	-	20	20	20
Impact Time Per Day (hours)	-	-	-	-	2.0	2.0	2.0
Number of Days	-	-	-	-	12.2	5.8	3.3
Total Impact Time (hours)	-	-	-	-	24.3	11.7	7.0
DTH Pile Driving							
Total Quantity	-	-	-	-	50	20	16
Max No. Piles Installed Per Day	-	-	-	-	4	4	4
Number Strikes Per Pile	-	-	-	-	54,000	54,000	54,000
Number Strikes Per Second	-	-	-	-	10	10	10
Total Drilling Time Per Pile (minutes)	-	-	-	-	90	90	90
Time Per Day (hours)	-	-	-	-	5	5	5
Number of Days	-	-	-	-	12.5	5.0	4.0
Total DTH Drilling Time (hours)	-	-	-	-	62.5	25.0	20.0

Phase II will involve the removal of existing piles, the installation and removal of temporary piles, and the installation of permanent piles in the North and South Harbor (Figure 3). Phase II will also involve the removal of approximately 22,000 cubic yards of material along the north side of the harbor. During Phase II 268 12-in (0.3 m) timber piles will be removed. Then, 24 24-in (0.6 m) steel piles, 80 steel H-piles, and 80 steel sheet piles will be installed. The installation and removal of 31 temporary 24-in (0.6 m) steel pipe piles will be completed to support permanent pile installation. As in Phase I, vibratory hammers, impact hammers, and DTH drilling will be used for the installation and removal of all piles (Table 2). Piles will be removed by dead-pull or vibratory methods. The installation and removal of temporary piles will be conducted using vibratory hammers. All permanent piles will be initially installed with a vibratory hammer. After vibratory driving, if needed, piles will be impacted into the bedrock with an impact hammer. For some piles, a DTH drill will be needed to drive piles the final few inches of embedment.

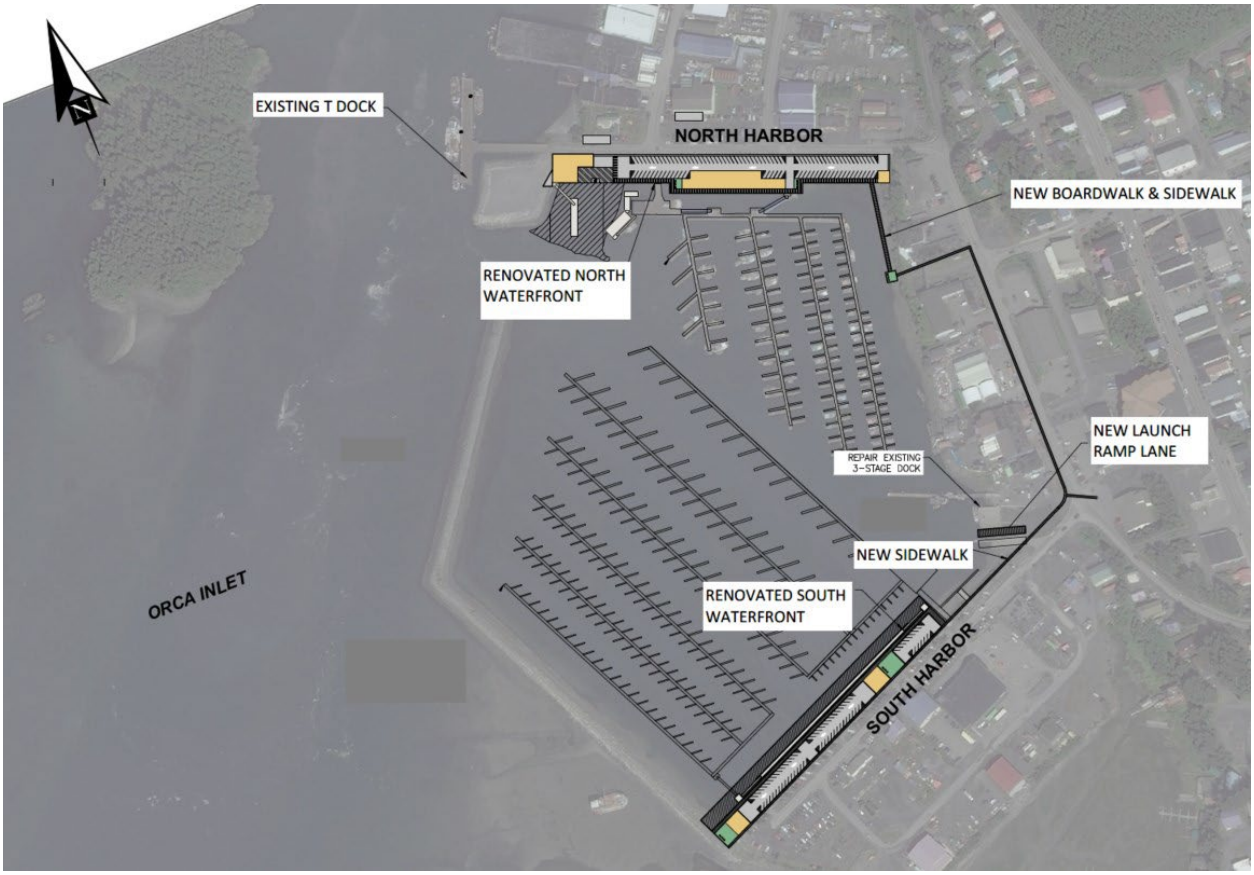

Figure 3. Cordova Harbor Rebuild Project North Waterfront Phase II.

Table 2. Summary of Pile Removal and Installation Activities for Phase II.

	Perm Pile Removal	Temp Pile Installation	Temp Pile Removal	Perm Pile Installation		
Diameter of Piles (inches) Pile Type Total Number of Piles	12 Timber 268	24 Steel 31	24 Steel 31	24 Steel 24	]6x 89 Steel H 80	Steel Sheet 80
Vibratory Pile Driving						
Total Quantity	268	31	31	24	80	80
Max No. Piles Vibrated Per Day	25	6	10	10	4	4
Vibratory Time Per Pile (minutes)	10	10	10	20	15	15
Vibratory Time Per Day (hours)	4.2	1.0	1.7	3.3	1.0	1.0
Number of Days	10.7	5.2	3.1	2.4	20.0	20.0
Total Vibratory Time (hours)	44.7	5.2	5.2	8.0	20.0	20.0
Impact Pile Driving						
Total Quantity	-	-	-	10	32	32
Max No. Piles impacted Per Day	-	-	-	4	4	4
Number Strikes Per Pile	-	-	-	20	20	20
impact Time Per Pile (minutes)	-	-	-	20	20	20
Impact Time Per Day (hours)	-	-	-	1.3	1.3	1.3
Number of Days	-	-	-	2.4	8.0	8.0
Total Impact Time (hours)	-	-	-	3.0	11.0	11.0
DTH Pile Driving						
Total Quantity	-	-	-	5	16	-
Max No. Piles Installed Per Day	-	-	-	2	3	-
Number Strikes Per Pile	-	-	-	54,000	54,000	-
Number Strikes Per Second	-	-	-	4	4	-
Total Drilling Time Per Pile (minutes)	-	-	-	150	150	-
Actual Drilling Time Per Pile (minutes)	-	-	-	60	60	-
Time Per Day (hours)	-	-	-	*2*	3	-
Number of Days	-	-	-	2.4	5.3	-
Total DTH Drilling Time (hours)	-	-	-	4.8	16.0	-

2.1.2 Other In-water Construction and Heavy Machinery Activities

In addition to the activities described above, both phases of the proposed action will involve other in-water construction and heavy machinery activities. Examples of other types of activities include using standard barges, tug boats, or other equipment to place and position piles on the substrate via a crane.

2.1.3 Excavating and Dredging Methods

To develop the South Harbor bulkhead, the project will require excavating 10,000 cubic yards above High Tide Line (HTL) in Phase I. To develop the North Harbor bulkhead, the project will require dredging 22,000 cubic yards in Phase II. Dredge material will be alluvial fill, gravel, and

riprap from silted-in sections of the harbor. Dredging will be expected to occur for 660 hours over 77 days in the North Harbor during Phase II. Approximately 1.5 acres in the North Harbor will be dredged below mean lower low water (MLLW) line to remove sediment accumulation and allow development of bulkheads (Table 3).

Table 3. Cordova Harbor Rebuild Project Groundwork Summary-Phase I and II.

Construction Activity	Description					
	Soil Type	Phase (Harbor)	Area (acres)	Total Quantity (cubic yards)	Total Time (hours)	# of Days
Excavating (above HTL)	Alluvial, Gravel, and Riprap	I (South)	1.0	10,000	300	35
Dredging	Alluvial, Gravel, and Riprap	II (North)	1.5	22,000	106	9
Filling	Alluvial, Gravel, and Riprap	I (South) (above HTL)	1.0	15,000	300	35
		II (North and Boat Launch)	1.5	47,970	385	33

Dredging and excavating soils will be stored at an upland location to dry before being used as fill within the proposed bulkheads. All unused removed material will be properly disposed of at a permitted offsite location.

2.1.4 Filling Methods

Following dredging and installation of piling for bulkheads, dredge soil and imported gravel fill will be placed within the bulkhead to support the structure, totaling 15,000 cubic yards for the South Harbor during Phase I and 47,300 yards for the North Harbor during Phase II. Placement of fill will be expected to occur over for 300 hours over 35 days for the South Harbor and 946 hours over 110 days for the North Harbor. The fill will be placed using an excavator and dozer and then compacted using a vibratory soil compactor.

There will be additional improvement of upland facilities adjacent to the harbor within existing developed areas. There will be no in-water noise impacts from placement of fill for the bulkheads and other upland construction to species since these activities will occur within the newly installed bulkhead structures.

Additionally, during Phase II, placement of a small volume of in-water fill will be required to develop the additional boat launch ramp lane in the South Harbor. Placement of 670 cubic yards of fill will be expected to occur over 5 hours and 1 day and may occur from land or water.

2.1.5 Construction Vessels and Movements

The following vessels or something similar are expected to support construction and protected species monitoring during both phases:

- One material barge (approximately 250 feet by 76 feet by 15.5 feet) to transport materials from Washington to the project site and to be used onsite as a staging area during construction.
- One construction barge (crane barge, 280 feet by 76 feet by 16 feet) to transport materials from Washington to the project site and to be used onsite to support construction.
- One skiff (25-foot skiff with a 125–250 horsepower outboard motor) transported to the project site on the material barge or acquired locally in Cordova to support construction activities.
- One skiff (25-35-foot skiff powered with a 35-50 horsepower outboard motor) transported to the project site on the material barge or acquired locally in Cordova to support Protected Species Observer efforts.

2.1.5.1 Transport of Materials and Equipment

Prior to each phase of construction, the material barge will transport materials from Washington State and the construction barge will travel from Juneau in Southeast Alaska to the project site (Figure 4 and Figure 5).

The barges will travel at a rate of approximately 6 knots.. These types of barges frequently travel this route to, from, and around Southeast Alaska. Once at the project site, the construction barge will be secured in place by four mooring anchors. The anchors will be below the surface and will not be a hazard to navigation. The material barge will be tied to the existing harbor structure and materials will be moved from the staging barge to the construction barge and project site by a crane on the construction barge. Local barge moves to the next pile installation area (in approximately 100-foot increments) will occur at a speed of less than 2 knots.

2.1.5.2 Transport of Workers to and from Work Platform

Construction workers will be transported from shore to the barge work platform by 90 horsepower skiffs travelling at approximately 5 knots during both phases of construction. The travel distance will be less than 300 feet. There could be multiple shore-to-barge trips during the day; however, the area of travel will be relatively small and close to shore. For the largest Phase II monitoring areas, Protected Species Observers (PSOs) may use a skiff to observe the action area.

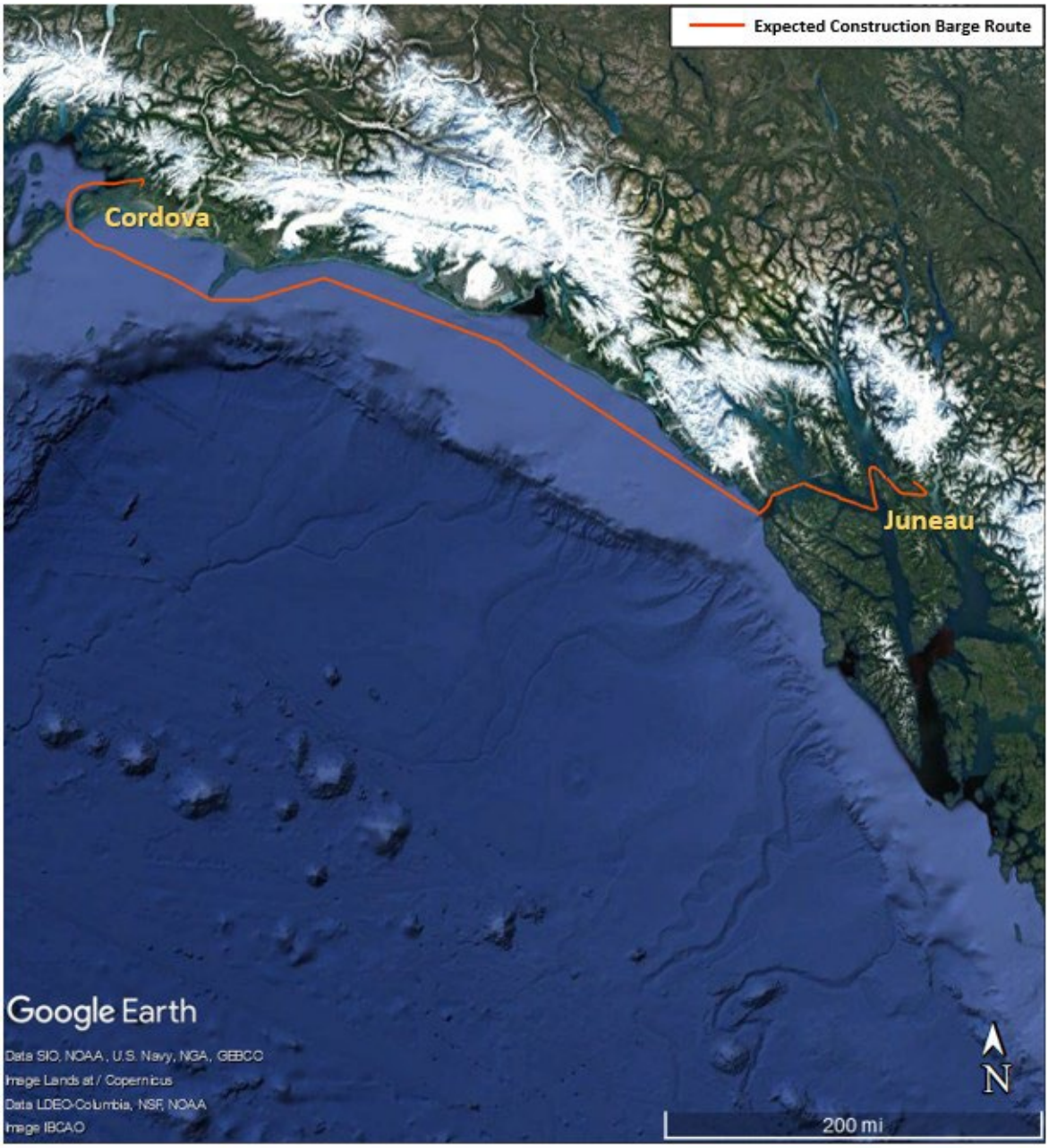

Figure 4. Cordova Harbor Rebuild Project Expected Construction Barge Route-Phase I and II (Solstice 2023).

Figure 5. Cordova Harbor Rebuild Project Expected Material Barge Route-Phase I and II (Solstice 2023).

2.1.6 Construction Sequence and Duration

Although actual construction sequencing will be developed by the contractor, the action agency expects that in-water construction for Phase I will begin with demolition of the existing South Harbor structures in fall of 2023 and will be completed by April 2024. It is expected that excavating for the breakwater area will occur following removal of the piles. Excavated materials will be placed on uplands in the harbor area. The contractor will then install bulkhead and float piles. Placement of fill will occur from land within the newly installed bulkheads. See Table 1 for the specific amount of time required to remove existing piles, install new piles and dredge during Phase I.

Construction of Phase II will follow a similar sequence with in-water work occurring between August 2024 and April 2025. See Table 2 for the specific amount of time required to remove existing piles, install and remove temporary piles, and install permanent piles during Phase II. Placement of fill for the boat launch ramp will be expected to take place over 5 hours on 1 day. Dredging in front of the proposed north bulkhead will take 660 hours over 77 days (Table 3).

2.1.7 Mitigation Measures

For all reporting that results from implementation of these mitigation measures, NMFS will be contacted using the contact information specified in Table 4. In all cases, notification will reference the NMFS consultation tracking number AKRO-2023-01396

2.1.7.1 General Mitigation Measures

1. MARAD will inform NMFS of impending in-water activities a minimum of one week prior to the onset of those activities.
2. If construction activities will occur outside of the time window specified in these measures, 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. Project-associated staff will cut all materials that form closed loops (e.g., plastic packing bands, rubber bands, and all other loops) prior to proper disposal in a closed and secured trash bin. Trash bins will be properly secured with locked or secured lids that cannot blow open, preventing trash from entering into the environment, thus reducing the risk of marine mammal entanglement should waste enter marine waters.
4. Project-associated staff will properly secure all ropes, nets, and other marine mammal entanglement hazards to ensure they do not blow or wash overboard.

2.1.7.2 Protected Species Observer (PSO) Measures

5. One to four (depending on in-water activity; Appendix A) NMFS-approved PSOs, able to accurately identify and distinguish species of Alaska marine mammals, will be present

before and during all in-water construction and demolition activities (Appendix A). For each in-water activity, PSOs will monitor all marine waters within the indicated shutdown and/or monitoring zone radius for that activity.

6. PSOs will be positioned such that they will collectively be able to monitor the entirety of each activity's shutdown zone. The action agency will coordinate with NMFS on the placement of PSOs prior to commencing in-water work.
7. Prior to commencing any in-water work, PSOs will scan waters within the appropriate shutdown zone and confirm no listed marine mammal species are within the shutdown zone for at least 30 minutes immediately prior to initiation of in-water activity. If one or more listed marine mammal species are observed within the shutdown zone, the in-water activity will not begin until the listed marine mammal species exit the shutdown zone of their own accord. Alternately, if the PSO has continuously scanned these waters and has not observed listed marine mammals within the zone for 30 minutes, then the in-water work may commence.
8. The pre-construction-activity-observation-period described in the above measure will take place at the start of each day of in-water activities, each time in-water activities have been shut down or delayed due the presence of a listed marine mammal species, and following cessation of in-water activities for a period of 30 minutes or longer.
9. The on-duty PSOs will continuously monitor the shutdown zone and adjacent waters during all in-water operations for the presence of listed species.
10. In-water activities will take place only:
    a. between local sunrise and sunset;
    b. during conditions with a Beaufort Sea State of 4 or less; and
    c. when the entire shutdown zone and adjacent waters are visible (e.g., monitoring effectiveness is not reduced due to rain, fog, snow, haze or other environmental or atmospheric conditions).
11. If visibility degrades such that a PSO can no longer ensure that the shutdown zone remains devoid of listed marine mammal species during in-water work, 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 marine mammal species for 30 minutes.
12. The PSO will order in-water activities to immediately cease if one or more listed marine mammal species has entered, or appears likely to enter, the associated shutdown zone.
13. If in-water activities are shut down for less than 30 minutes due to the presence of listed marine mammal species in the shutdown zone, in-water work may commence when the PSO provides assurance that listed marine mammal species were observed exiting the shutdown zone. Otherwise, the activities may only re-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).

14. Following a lapse of in-water activities of more than 30 minutes, the PSO will authorize resumption of activities (using soft-start procedures for impact pile driving activities) only after the PSO provides assurance that listed marine mammal species have not been present in the shutdown zone for at least 30 minutes immediately prior to resumption of operations.
15. If a listed marine mammal 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 4.
16. PSOs will have no other primary duties beyond watching for, acting on, and reporting events related to listed species.
17. 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 disapproval in instances where an individual is not approved.
18. At least one PSO will have prior experience performing the duties of a PSO during construction activity.
19. At least one PSO on the project will complete PSO training prior to deployment (contact NMFS AKR PRD for a list of trained and experienced PSOs). The 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.
20. When a team of three or more PSOs are required, a lead observer or monitoring coordinator will be designated.
21. PSOs will:
    a. have vision that allows for adequate monitoring of the entire shutdown zone;
    b. have the ability to effectively communicate orally, by radio and in person, with project personnel;
    c. be able to collect field observations and record field data accurately and in accordance with project protocols;

d. be able to identify to species all marine mammals that occur in the action area; and

e. have writing skills sufficient to create understandable records of observations.

22. PSOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break from monitoring duties between shifts. PSOs will not perform PSO duties for more than 12 hours in a 24-hour period.

23. PSOs will have the ability and authority to order appropriate mitigation responses, including shutdowns, to avoid takes of all listed species.

24. The PSOs will have the following equipment to address their duties:

    a. tools which enable them to accurately determine the position of a marine mammal in relationship to the shutdown zone;

    b. two-way radio communication, or equivalent, with onsite project manager;

    c. tide tables for the project area;

    d. watch or chronometer;

    e. binoculars (7x50 or higher magnification) with built-in rangefinder or reticles (rangefinder may be provided separately);

    f. instruments that allow observer to determine geographic coordinates of observed marine mammals;

    g. a legible copy of this opinion and all appendices; and

    h. legible and fillable observation record form allowing for required PSO data entry.

25. 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.

2.1.7.3 Impact Pile driving

26. 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 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.

27. Following this soft-start procedure, operational impact pile driving may commence and

continue provided listed species remain absent from the shutdown zone.

2.1.7.4 Down the Hole (DTH) drilling

28. If no listed species are observed within the DTH 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 activate the drilling equipment at no more than half the operational power for several seconds, followed by a 30 second waiting period, then two subsequent reduced power start-ups. A soft start must be implemented at the start of each day's DTH pile driving, any 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.
29. Following this soft-start procedure, operational pile driving may commence and continue provided listed species remain absent from the shutdown zone.
30. Following a lapse of pile driving activities of more than 30 minutes, the PSO will authorize resumption of 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.

2.1.7.5 Dredging/Screeding

31. All vessels involved in dredging, screeding, and underwater excavating operations, including survey vessels, will travel at velocities below 10 knots.
32. Dredging, screeding and underwater excavating activities must shut down whenever a listed marine mammal approaches within 300 m.

2.1.7.6 Placement of Fill

33. Fill material will be obtained from local sources when available, avoiding the need to ship fill through marine mammal habitat and minimizing the risk of introducing non-native species.

2.1.7.7 Vessels

34. Vessel operators will:
    a. maintain a watch for marine mammals at all times while underway;
    b. stay at least 91 m (100 yards) away from listed marine mammals, except they will remain at least 460 m (500 yards) from endangered North Pacific right whales;
    c. travel at less than 5 knots (9 km/hour) when within 274 m (300 yards) of a whale;
    d. avoid changes in direction and speed when within 274 m (300 yards) 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 vessel gets underway; and

g. reduce vessel speed to 10 knots or less when weather conditions reduce visibility to 1.6 km (1 mi) or less.

35. 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)) (note: these regulations apply to all humpback whales). Specifically, pilot and crew will not:

    a. approach, by any means, including by interception (i.e., placing a vessel in the path of an oncoming humpback whale), within 100 yards of any humpback whale;

    b. cause a vessel or other object to approach within 100 yards of a humpback whale; or

    c. disrupt the normal behavior or prior activity of a whale by any other act or omission.

36. 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 yards) of the vessel, or 460 m (500 yards) in the case of North Pacific right whales, and if maritime conditions safely allow, the engine will be put in neutral and the whale will be allowed to pass beyond the vessel.

37. Vessels will take reasonable steps to alert other vessels in the vicinity of whale(s).

38. 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, North Pacific Right Whales, and their Critical Habitat

39. Vessels will:

    a. remain at least 460 m (500 yards) from North Pacific right whales; and

    b. not travel through designated North Pacific right whale critical habitat if practicable (50 CFR 226.215). If traveling through North Pacific right whale critical habitat cannot be avoided, vessels will:

        i. travel through North Pacific right whale critical habitat at 5 knots or less (without a PSO on watch); or at 10 knots or less while PSOs maintain a constant watch for marine mammals from the bridge; and

ii. maintain a log indicating the time and geographic coordinates at which vessels enter and exit North Pacific right whale critical habitat.

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

40. Vessels will not approach within 5.5 km (3 nm) of rookery sites listed in 50 CFR § 224.103(d).
41. 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).

2.1.7.8 Wood Treated Pilings

The following mitigation measures were designed to avoid adverse effects to salmonids, however they may be appropriate for other listed species, especially salmonid-eating marine mammals.

Removal

42. If piles located within the project area have been abandoned or are no longer in use, they will be removed or cut off at the sediment line.
43. Piles slated for removal will be completely removed. Removal by vibratory pulling will be attempted, and if unsuccessful, piles will be dead pulled. Should pulling of piles be unsuccessful, they will be cut off at the sediment line.
44. Piles will be reused or disposed of in a manner that does not expose or affect aquatic or marine resources.

2.1.7.9 Sunflower Sea Stars and Dredge/Fill Activities

45. Within habitat potentially occupied by sunflower sea stars, a survey for sunflower sea stars will be conducted each day prior to dredge or fill operations below MHW, where the survey covers the full extent of the substrate upon which fill will be placed.
    a. Each day, sunflower sea star surveyors will systematically examine all intertidal and subtidal areas that may be impacted by dredge or fill operations during that day.
    b. Survey transects will run roughly parallel to the shore with 2 m separation between each transect line until the entire area that will be impacted by dredge or fill operations on that day is surveyed. Surveys may be done on foot at low tide or by divers for areas that cannot be surveyed by foot during low tide.
    c. Sea stars that are found will be gently moved into a bucket of water collected at the site, and taken to a location at least 100 m away from the dredge or fill area and gently released onto the substrate. The number of sunflower sea stars moved

will be recorded, noting the diameter of each individual, and reported to NMFS (Mitigation Measure 70).

46. If it appears that a sunflower sea star has sea star wasting or if any dead sunflower sea stars are observed, take pictures of the individuals and count how many appear to be infected, but do not touch or move these individuals.

2.1.7.10 General Data Collection and Reporting

Data Collection

47. PSOs will record observations on data forms or into electronic data sheets.
48. The action agency will ensure that PSO data will be submitted electronically in a format that can be queried such as a spreadsheet or database (i.e. digital images of data sheets are not sufficient).
49. PSOs will record the following:
    a. the date, shift start time, shift stop time, and PSO identifier;
    b. date and time of each reportable event (e.g., a marine mammal observation, operation shutdown, reason for operation shutdown, change in weather);
    c. weather parameters (e.g., % cloud cover, % glare, visibility) and sea state where the Beaufort Wind Force Scale will be used to determine sea-state (https://www.weather.gov/mfl/beaufort);
    d. species, numbers, and, if possible, sex and age class of observed marine mammals, and observation date, time, and location;
    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 human presence;
    g. initial, closest, and last known 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;
    h. whether the presence of marine mammals necessitated the implementation of mitigation measures to avoid acoustic impact, and the duration of time that normal operations were affected by the presence of marine mammals; and
    i. geographic coordinates for the observed animals, (or location noted on a chart) with the position recorded using the most precise coordinates practicable (coordinates will be recorded in decimal degrees, or similar standard and defined coordinate system).

Data Reporting

50. All observations of North Pacific right whales will be reported to NMFS within 24 hours. These observation reports will include the following information:
    a. date, time, and geographic coordinates of the observation(s);
    b. number of North Pacific right whales observed, including number of adults/juveniles/calves observed, if determinable; and
    c. environmental conditions as they existed during each observation event, including sea conditions, weather conditions, visibility, lighting conditions, and % ice cover.
51. When project vessels are traveling within North Pacific right whale critical habitat in a manner that requires the use of PSOs (i.e., Vessel is traveling within North Pacific right whale critical habitat at greater than 5 kts), PSOs will collect, organize, and report on vessel travel within North Pacific right whale critical habitat and on marine mammal observations made within that critical habitat. These reports will be submitted to AKR.section7@noaa.gov by the end of the calendar year. The report will contain the following information:
    a. time and location at which a vessel entered and exited North Pacific right whale critical habitat;
    b. species, date, and time for each marine mammal observation;
    c. number of animals per observation event; and number of adults/juveniles/calves per observation event (if determinable);
    d. geographic coordinates for the observed animals, with the position recorded using the most precise coordinates practicable (coordinates will be recorded in decimal degrees, or similar standard (and defined) coordinate system);
    e. environmental conditions as they existed during each observation event, including sea conditions, weather conditions, visibility, lighting conditions, and % ice cover; and
    f. photographs and video of North Pacific right whales that were encountered.
52. Observations of humpback whales will be transmitted to AKR.section7@noaa.gov by the end of the calendar year, including information specified in General Data Collection and Reporting (above) and photographs and videos obtained of humpback whales, most notably those of the whale's flukes.

Unauthorized Take

53. 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 Mitigation Measures under the *Final Report* heading 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, and, if known, 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 contact information for 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)

54. 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

55. 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 2; 1-800-853-1964).

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

Monthly Report

57. Submit interim monthly PSO monitoring reports, including data sheets. These reports will include a summary of marine mammal species and behavioral observations, shutdowns or delays, and work completed.

58. Monthly reports will be submitted to AKR.section7@noaa.gov by the 15th day of the month following the reporting period. For example the report for activities conducted in June, 2023 will be submitted by July 15th, 2023.

Final Report

59. A draft of the 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. A final report must be prepared and submitted within 30 calendar days following receipt of any NMFS comments on the draft report. If no comments are received from NMFS within 30 calendar days of receipt of the draft report, the report may be considered final. 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.

60. The final report will include:

    a. summaries of monitoring efforts, including dates and times of construction, dates and times of monitoring, dates and 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/size/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;

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

    h. results of sunflower sea star surveys and any mitigation measures taken.

2.1.7.11 Summary of Agency Contact Information

Table 4. Summary of agency contact information.

Reason for Contact	Contact Information
Consultation Questions & Unauthorized Take	AKR.prd.section7@noaa.gov and David Gann (david.gann@noaa.gov)
Reports & Data Submittal	AKR.section7@noaa.gov (please include NMFS tracking number AKRO-2023-01396in subject line)
Stranded, Injured, or Dead Marine Mammal *(not related to project activities)*	Stranding Hotline (24/7 coverage) 877-925-7773
Oil Spill & Hazardous Materials Response	U.S. Coast Guard National Response Center: 1-800-424-8802 & 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 Or 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.

Orca Inlet is an approximately 48-kilometer-long (30 miles) elongated estuary that adjoins the

southern end of Orca Bay. The bay varies between 2.5 and 5.6 kilometers (1.5 to 3.5 miles) wide. South of Cordova Harbor, Orca Inlet is relatively shallow with exposed mudflats at a zero tide. North of Cordova Harbor, Orca Inlet is deeper which provides the only access to the harbor for deeper drafting boats.

The proposed harbor rebuild project is located at the Cordova Harbor within the City of Cordova on the eastern shore of Orca Inlet within eastern Prince William Sound, Alaska. The action area includes: (1) the area in which construction activities will take place, (2) an ensonified area around the pile removal and installation activities (see Figures 6 and 7), and (3) the vessel transit routes taken by the material and construction barges to the project site (see Figures 4 and 5).

NMFS defines the ensonified portion of 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 will occur).

Propagation of noise from the proposed project is partially contained by the breakwaters at the entrance to Cordova Harbor, by Spike Island- approximately 210 m to the west of the harbor entrance, and constrained within Orca Inlet by Hawkins Island to the northwest, and Hinchinbrook Island to the southwest. The project action area extends 4.5 kilometers (2.8 miles) during Phase I and 36.4 kilometers (22.6 miles) during Phase II (Figures 6 and 7).

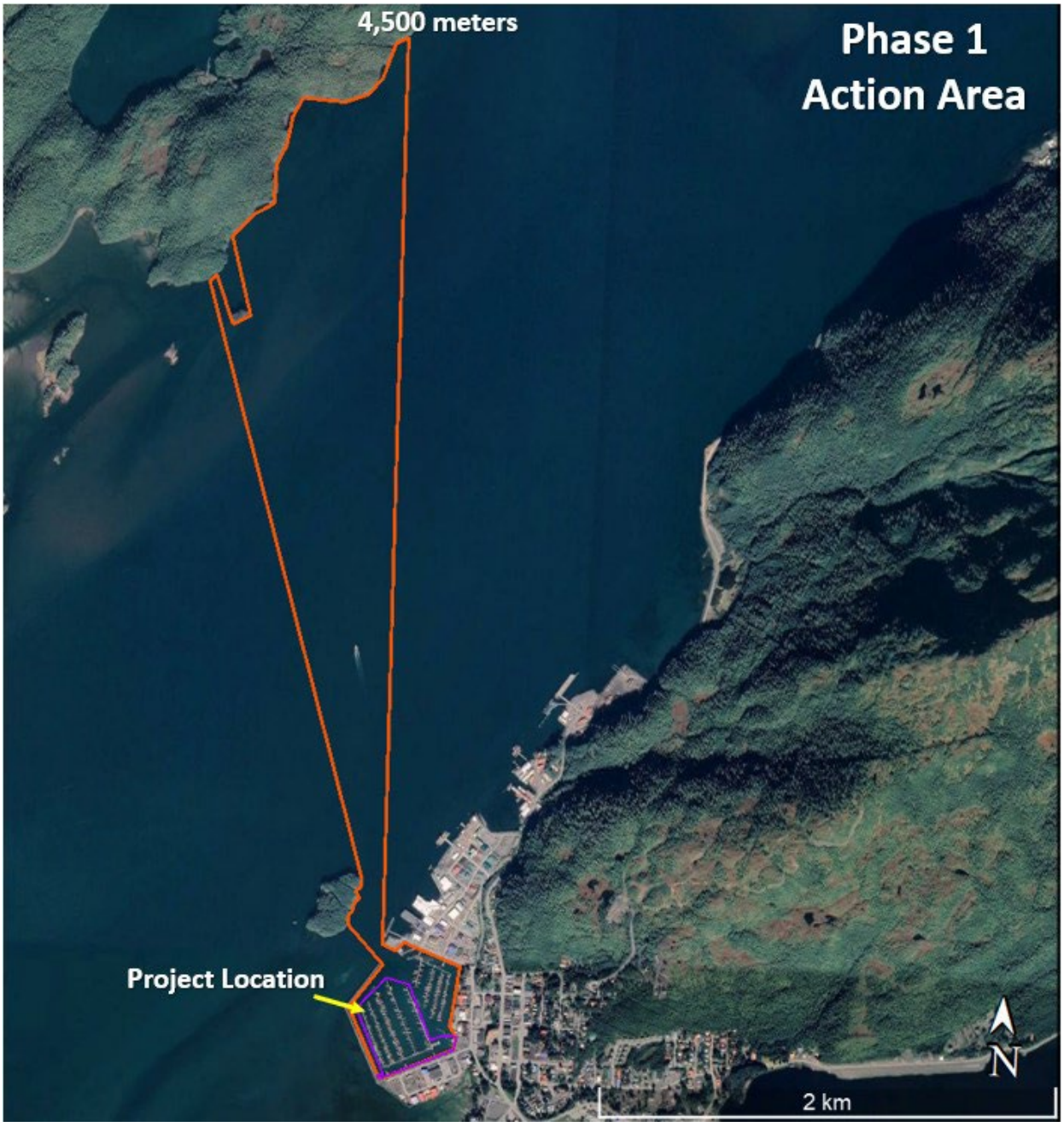

Figure 6. Cordova Harbor Rebuild Project Phase I Action Area (Solstice 2023).

Figure 7. Cordova Harbor Rebuild Project Phase II Action Area (Solstice 2023).

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 designation(s) of critical habitat for Western DPS Steller sea lions uses 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).

Essential features of Mexico DPS humpback whale, and Western North Pacific humpback whale critical habitat are also described as 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 whether 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 gender of the individuals that are likely to be exposed to stressors and the populations or subpopulations those individuals represent. NMFS also evaluates the proposed action's effects on critical habitat 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 6. Although critical habitat has been designated for the Western North Pacific DPS and the Mexico DPS of humpback whale, there is no critical habitat for these populations in the action area. The critical habitat area for Mexico DPS humpback whales is immediately adjacent to the action area, but excludes Orca Inlet. The materials and construction barges will pass through critical habitat for the Mexico DPS humpback whale. Critical habitat was designated for the Mexico DPSs on May 21, 2021(Figure 7; 86 FR 21082, April 21, 2021). 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, October 9, 2019). 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 will affect the prey distribution or abundance in a meaningful or measurable way. Therefore, these critical habitats are not considered further in this opinion.

Table 5. Listing status and critical habitat designation for species considered in this opinion.

Species	Status	Listing	Critical Habitat
Humpback Whale, Mexico DPS *(Megaptera novaeangliae)*	Threatened	NMFS 2016, 81 FR 62260	NMFS 2021 86 FR 21082 None in the action area
Humpback Whale, Western North Pacific DPS *(Megaptera novaeangliae)*	Endangered	NMFS 2016, 81 FR 62260	NMFS 2021 86 FR 21082 None in the action area
Fin Whale (*Balaneoptera physalus*)	Endangered	NMFS 1970, 35 FR 18319	Not designated
Steller Sea Lion, Western DPS *(Eumetopias jubatus)*	Endangered	NMFS 1997, 62 FR 24345	NMFS 1993, 58 FR 45269
Sunflower Sea Star *(Pycnopodia helianthoides)*	Proposed	N/A	N/A

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 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 listed species or designated critical habitat.

The second criterion is the probability of a response given exposure. For 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 will 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: Western North Pacific DPS humpback whale, Mexico DPS humpback whale, fin whale, and critical habitat for Steller sea lion. Below we discuss our rationale for those determinations.

4.1.1 Western North Pacific DPS and Mexico DPS Humpback Whales

The abundance estimate for humpback whales in the Gulf of Alaska is 2,129 (CV=0.08) animals, which includes whales from the Hawaii DPS (89 %), Mexico DPS (11 %), and Western North Pacific DPS (1 percent; Wade 2021). Humpback whales occur throughout the central and western Gulf of Alaska from Prince William Sound to the Shumagin Islands. Large numbers of humpbacks have been reported in waters over the continental shelf, extending up to 100 nm offshore in the western Gulf of Alaska (Rone, Zerbini et al. 2017, Wade 2021). Seasonal concentrations are found in coastal waters of Prince William Sound, which is an important feeding ground (Teerlink, von Ziegesar et al. 2015).

As addressed previously, Orca Inlet is located within relatively shallow waters between Hinchinbrook and Hawkins Islands. Given the near-shore location of the project area, humpback whales are not expected within the harbor or the action area that extends beyond the harbor breakwater. Anecdotal evidence based on communication with the Cordova Harbormaster, and Prince William Sound Science Center scientists indicates that humpback whales are observed in the vicinity of Cordova Harbor, approximately six miles away where Orca Inlet meets Orca Bay (Solstice 2023).

It is possible that humpback whales may be encountered during barge transit to the construction site in Cordova Harbor. Therefore, the species could be at-risk for vessel strike. However, it is extremely unlikely that project vessels will strike humpback whales for the following reasons:

- The material barge and the construction barges are slow moving vessels, reducing the potential for collisions.
- All vessels associated with this action will follow the mitigation measures outlined in Section 2 of this opinion, and will specifically adhere to the Alaska Humpback Whale Approach Regulations when transiting to and from the project site.

While it is possible (although unlikely) that a humpback whale may be in the general area of construction activities, it is highly unlikely that a humpback whale will be exposed to project-related noises for the following reasons:

- There have been no sightings of humpback whales within the area that will be ensonified, and they are not expected to inhabit the shallow and protected waters of Orca Inlet.
- The only additional noise which may be affiliated with the project is the vessel noise associated with the barges and skiffs. The mitigation measures include best practices for

reducing vessel-related harassment.

- The mitigation measures require PSOs to call an immediate shutdown of pile driving activities should a species that is not authorized to be taken (such as humpback whale) be observed approaching the harassment zones.

For these reasons, we conclude the stressors associated with the proposed action will either have no effect or immeasurably small effects on humpback whales. Humpback whales are not anticipated to overlap in time and space with project activities thus are not anticipated to be exposed to project-related noise, and the effects of ship strike are extremely unlikely to occur. Therefore, Western North Pacific DPS and Mexico DPS humpback whales are not likely to be adversely affected by this action.

4.1.2 Fin Whales

Fin whales are typically found in deep water (Matsuoka, Mizroch et al. 2013, Rone, Zerbini et al. 2017) away from the immediate coast (Clarke, Brower et al. 2020). Consequently it is unlikely that they will overlap with effects from coastally-based construction activities. This is especially true of Orca Inlet which is located within relatively shallow waters between Hinchinbrook and Hawkins Islands. Given the near-shore location of the project area, fin whales are not expected within the harbor or the action area that extends beyond the harbor breakwater. Anecdotal evidence based on communication with the Cordova Harbormaster, and Prince William Sound Science Center scientists indicates that fin whales have not been observed in the vicinity of Cordova Harbor, and are not expected to be in the action area (Solstice 2023).

It is possible that fin whales may be encountered during barge transit to the construction site in Cordova Harbor. Therefore, the species could be at-risk for vessel strike. However, it is extremely unlikely that project vessels will strike humpback whales for the following reasons:

- The material barge and the construction barges are slow moving vessels, reducing the potential for collisions.
- All vessels associated with this action will follow the mitigation measures outlined in Section 2 of this opinion when transiting to and from the project site.

While it is possible (although unlikely) that a fin whale may be in the general area of construction activities, it is highly unlikely that a fin whale will be exposed to project-related noises for the following reasons:

- There have been no sightings of fin whales within the area that will be ensonified, and they are not expected to inhabit the shallow and protected waters of Orca Inlet.
- The only additional noise which may be affiliated with the project is the vessel noise associated with the barges and skiffs. The mitigation measures include best practices for reducing vessel-related harassment.

- The mitigation measures require PSOs to call an immediate shutdown of pile driving activities should a species that is not authorized to be taken (such as fin whale) be observed approaching the harassment zones.

For these reasons, we conclude the stressors associated with the proposed action will either have no effect or immeasurably small effects on fin whales. Fin whales are not anticipated to overlap in time and space with project activities thus are not anticipated to be exposed to project-related noise, and the effects of ship strike are extremely unlikely to occur. Therefore, fin whales are not likely to be adversely affected by this action.

4.1.3 Steller Sea Lion Critical Habitat

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

1. Alaska rookeries, haulouts, and associated areas identified at 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 144º W. longitude; and

    d. Aquatic zones that extend 37 km (23 mi) seaward from each major rookery and major haulout west of 144° W. longitude.

2. Three special aquatic foraging areas identified at 50 CFR 226.202(c):

    a. Shelikof Strait

    b. Bogoslof

    c. Seguam Pass

Mitigation measures #40 and #41 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 accustomed to shipping traffic. The passage of a vessel on the surface of the water is not expected to measurably disrupt or disturb any of the primary prey species which Steller sea lions depend upon and therefore the quality and availability of their prey resources will not be diminished. For these reasons we conclude that there is no aspect of the passage of the materials and construction barges over or near critical habitat that will negatively impact the essential

features of Steller sea lion critical habitat.

In summary we find that the temporary passage of the materials and construction barges over the water surface of critical habitat for Steller sea lions will have an immeasurably small effect on the features determined to be essential for these species.

The ensonified action area for pile driving activities extends through Orca Inlet. It overlaps with Steller sea lion designated critical habitat (Figure 8). While all of the important aquatic features for Steller sea lions exist in the action area for pile driving activities, prey availability has been declining in recent years and sea lions may prefer other suitable habitat. The herring population in Prince William Sound declined drastically in the 1990s and again during the Pacific marine heatwave (NMFS 2020). Pacific cod biomass in the Gulf of Alaska has been declining since 2009 and plunged sharply downward between 2016 and 2017 (NMFS 2020).

The Steller sea lion rookery nearest to this project is on Seal Rocks, located in the Hinchinbrook Entrance between Hinchinbrook and Montague Islands, 73 km southwest of the project site (Figure 8). The nearest major haulouts are Cape Hinchinbrook located on Hinchinbrook Island, approximately 60 km southwest of the project site, and Hook Point also located on Hinchinbrook Island, 37 km southwest of the project site.

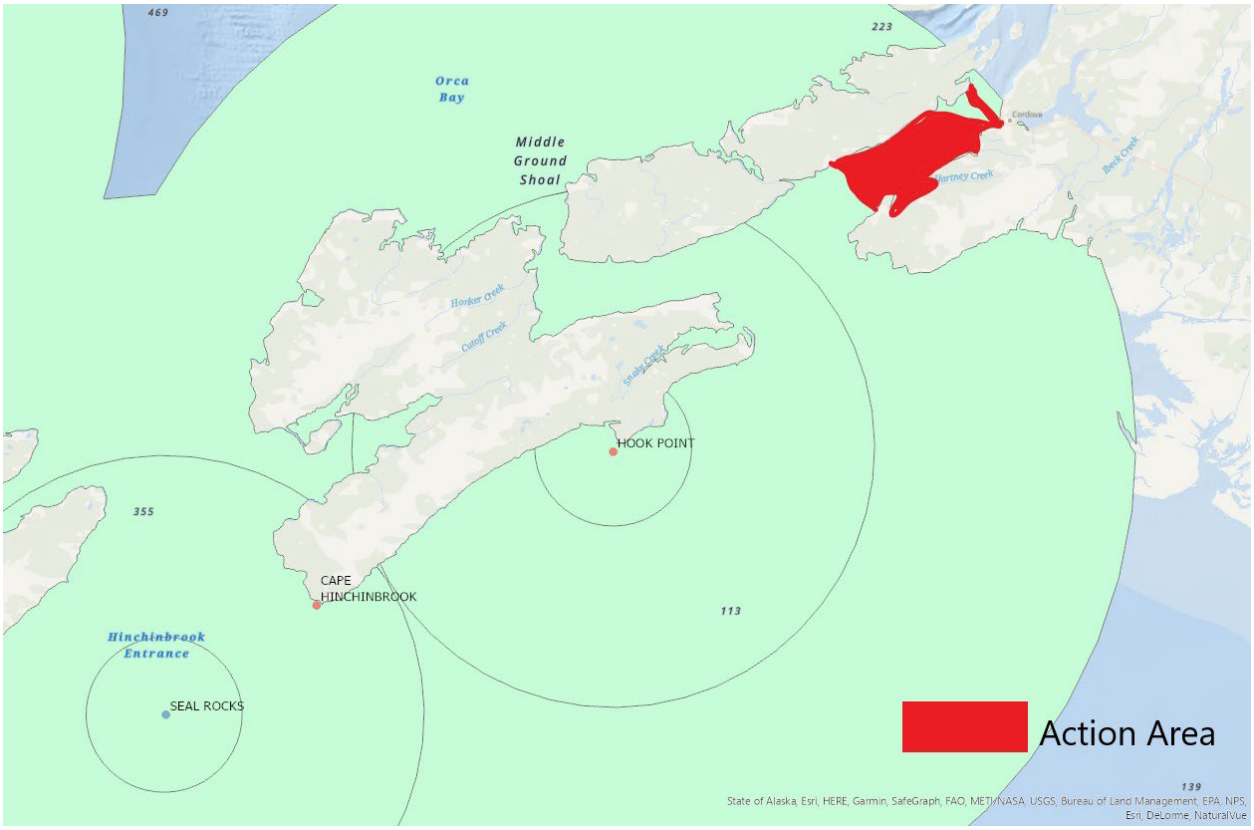

Figure 8. Steller sea lion critical habitat near Cordova, AK.

Based on the distance of the construction site from major haulouts and rookeries, and the mitigation measures in place to avoid impacts to marine mammals and designated critical habitat, we expect any adverse effects to designated critical habitat for Steller sea lions will be immeasurably small.

We determine that this proposed action is not likely to adversely affect critical habitat for Steller sea lions. As such, critical habitat will not be discussed further in this opinion.

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 that follow. 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 in general, and in the Arctic specifically:

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

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

http://nsidc.org/arcticseaicenews/

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

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

4.2.1 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[1]. 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)[2].

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, Overland et al. 2017, Richter-Menge 2019). The average annual temperature is now 3-4°F warmer than during the early and mid-century (Figure 9; Thoman and Walsh 2019). The average annual temperature for Alaska in 2022 was 28.6°F, 2.6°F above the long-term average, ranking

[1] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202213 viewed 2/17/2023.
[2] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202213 viewed 2/17/2023.

16th warmest in the 98-year record for the state[3]. 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, Trainor et al. 2014).

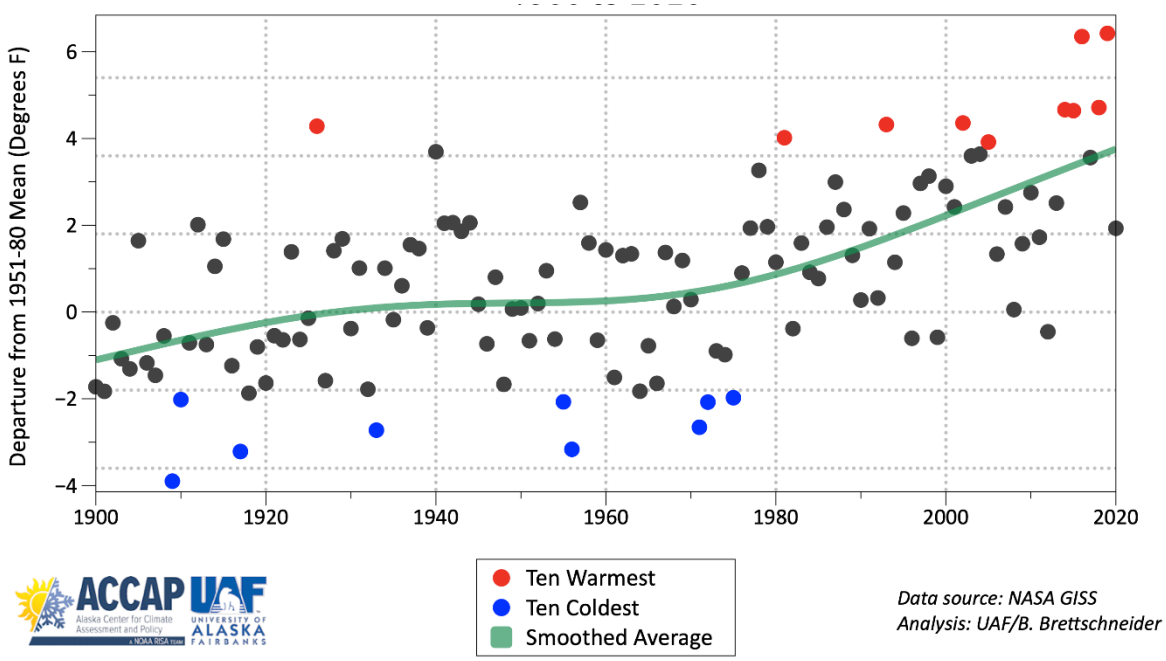

Figure 9. Alaska Annual Temperature 1900 to 2020.

4.2.2 Marine water temperature

Higher air temperatures have led to higher ocean temperatures. More than 90 % of the excess heat created by global climate change is stored in the world's oceans, causing increases in ocean temperature (IPCC 2019, Cheng, Abraham et al. 2020). The four highest annual global ocean heat content (OHC), which measures 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, Mediterranean, and southern oceans recorded their highest OHC since the 1950s[4].

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 10). 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 % per decade (Stroeve, Holland et al.

[3] https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/202213 viewed 2/17/2023.
[4] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202213 viewed 2/17/2023.

2007, Stroeve and Notz 2018).

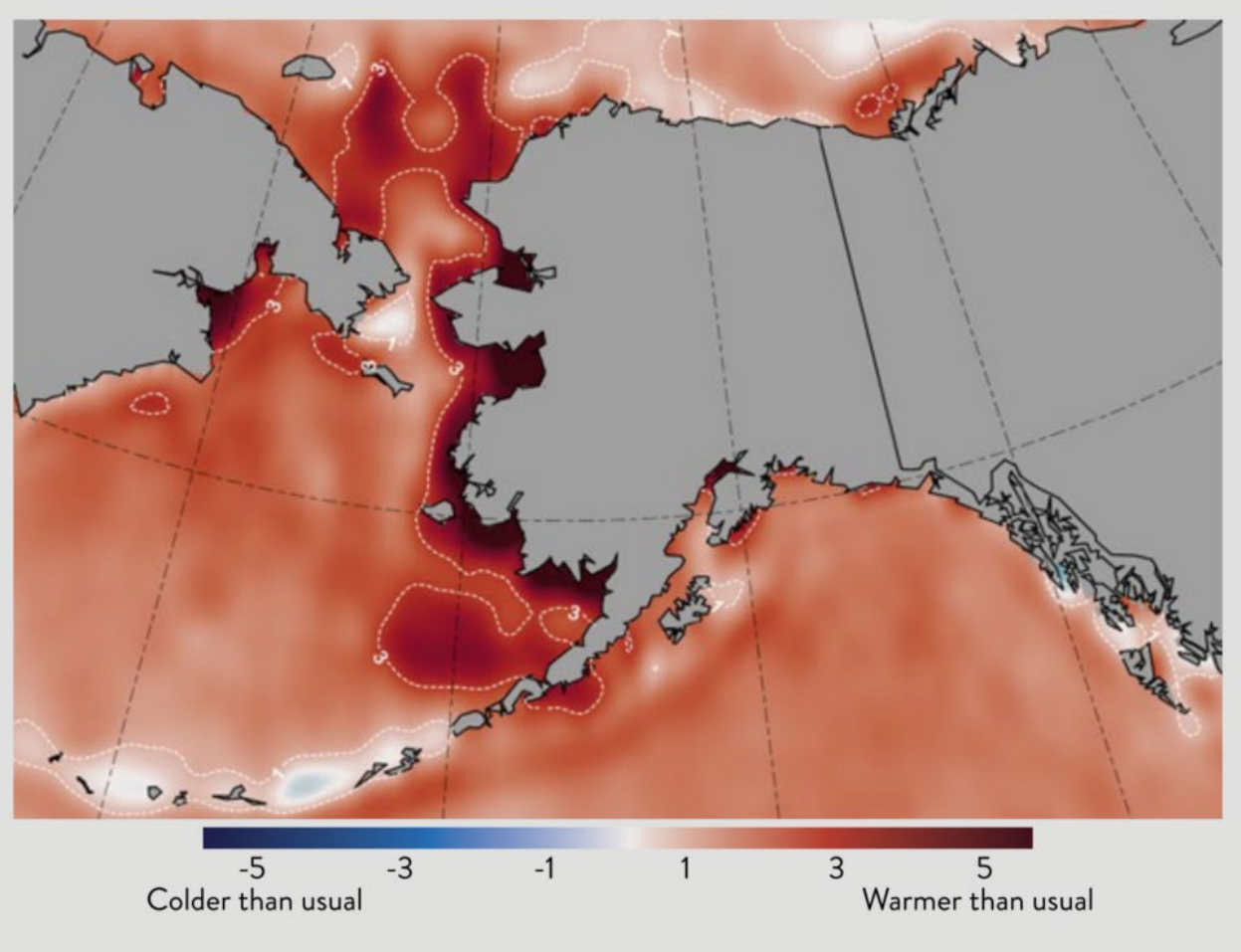

Figure 10. Summer Sea Surface Temperatures 2014-2018 (Thoman and Walsh 2019).

In the Pacific Arctic, with the reduction in the cold-water pool in the northern Bering Sea, large scale northward movements of commercial stocks are underway as previously cold-dominated ecosystems warm, and fish move northward to higher latitudes (Grebmeier, Overland et al. 2006, Eisner, Zuenko et al. 2020). Not only fish, but plankton, crabs, and, ultimately, sessile invertebrates like clams are affected by these changes in water temperature (Grebmeier, Overland et al. 2006, Fedewa, Jackson 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, Fischer et al. 2018). Marine heatwaves are a key ecosystem driver and nearly 70 % of global oceans experienced strong or severe heatwaves in 2016, compared to 30 % in 2012 (Suryan, Arimitsu 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, Fischer 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, Arimitsu 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, Demko et al. 2016).

Cetaceans, forage fish (capelin and herring), Steller sea lions, adult cod, chinook and sockeye salmon in the Gulf of Alaska were all impacted by the Pacific marine heatwave (Bond, Cronin et al. 2015, Peterson, Bond et al. 2016, Sweeney, Towell et al. 2018).

The 2018 Pacific cod stock assessment[5] 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. The spawning stock biomass dropped below 20 % of the unfished spawning biomass in 2020; 20 % 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, Holsman et al. 2020). As of 2022, Pacific cod has not recovered from the decline during the 2014-2016 marine heatwave[6].

4.2.3 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, Seibel et al. 2008, Lüthi, Le Floch 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, Sabine et al. 2004, Feely, Doney et al. 2009). Despite the oceans' role as large carbon sinks, the CO2 level continues to rise and is currently at 419 ppm[7].

As the oceans absorb CO2, the buffering capacity and pH of seawater are 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, Mathis 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, Doney et al. 2009).

High latitude oceans have naturally lower saturation states of calcium carbonate minerals than

[5] https://www.fisheries.noaa.gov/alaska/population-assessments/2018-north-pacific-groundfish-stock-assessments accessed 2/17/23.
[6] https://apps-afsc.fisheries.noaa.gov/REFM/docs/2022/GOA-ESR-Brief.pdf accessed 2/17/23.
[7] https://gml.noaa.gov/ccgg/trends/ accessed 2/17/23.

more temperate or tropical waters, making Alaska's oceans more susceptible to the effects of ocean acidification (Fabry, McClintock et al. 2009, Jiang, Feely 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, Doney et al. 2009, Qi, Chen 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, McClintock 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, Kawamiya et al. 2012, DeGrandpre, Evans et al. 2020).

Undersaturated waters are potentially highly corrosive to any calcifying organism, such as corals, bivalves, crustaceans, echinoderms and many forms of zooplankton such as copepods and pteropods, and, consequently, may affect Arctic food webs (Fabry, Seibel et al. 2008, Bates, Mathis 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, Fabry 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, Seibel 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, Bettez et al. 2005, Burek, Gulland et al. 2008, Doney, Ruckelshaus et al. 2012, Huntington, Danielson 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, 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, Macleod et al. 2006, Isaac 2009). Macleod (2009) estimated that, based on expected shifts in water temperature, 88 % of cetaceans will be affected by climate change, 47 % will be negatively affected, and 21 % 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 face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR § 402.02. The opinion also examines the condition of critical habitat throughout the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

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. For designated critical habitat, we present a summary of the critical habitat designation, the geographical area of the designation, and any physical or biological features essential to the conservation of the species, as well as any relevant threats and management considerations. That is, we rely on the status of critical habitat and its function as a whole to determine whether an action's effects are likely to diminish the value of critical habitat as a whole for the conservation of listed species.

4.3.1 Western DPS Steller Sea Lions

4.3.1.1 Status and Population Structure

Steller sea lions were listed as a threatened species under the ESA on December 4, 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 2008) 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, Helker 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 2008). 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, Helker 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, L. Fritz 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, Cronin et al. 2015, Petersen, Krätschell et al. 2016, Muto, Helker 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, Helker et al. 2021).

4.3.1.2 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, Rugh et al. 1984). Although Steller sea lions seasonally inhabit coastal waters of Japan in the winter, breeding rookeries outside of the U.S. are located only 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, Pendleton et al. 2013, Muto, Helker et al. 2021).

Land sites used by Steller sea lions are referred to as rookeries and haulouts (Figure 11). 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, Sease 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, Pendleton 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).

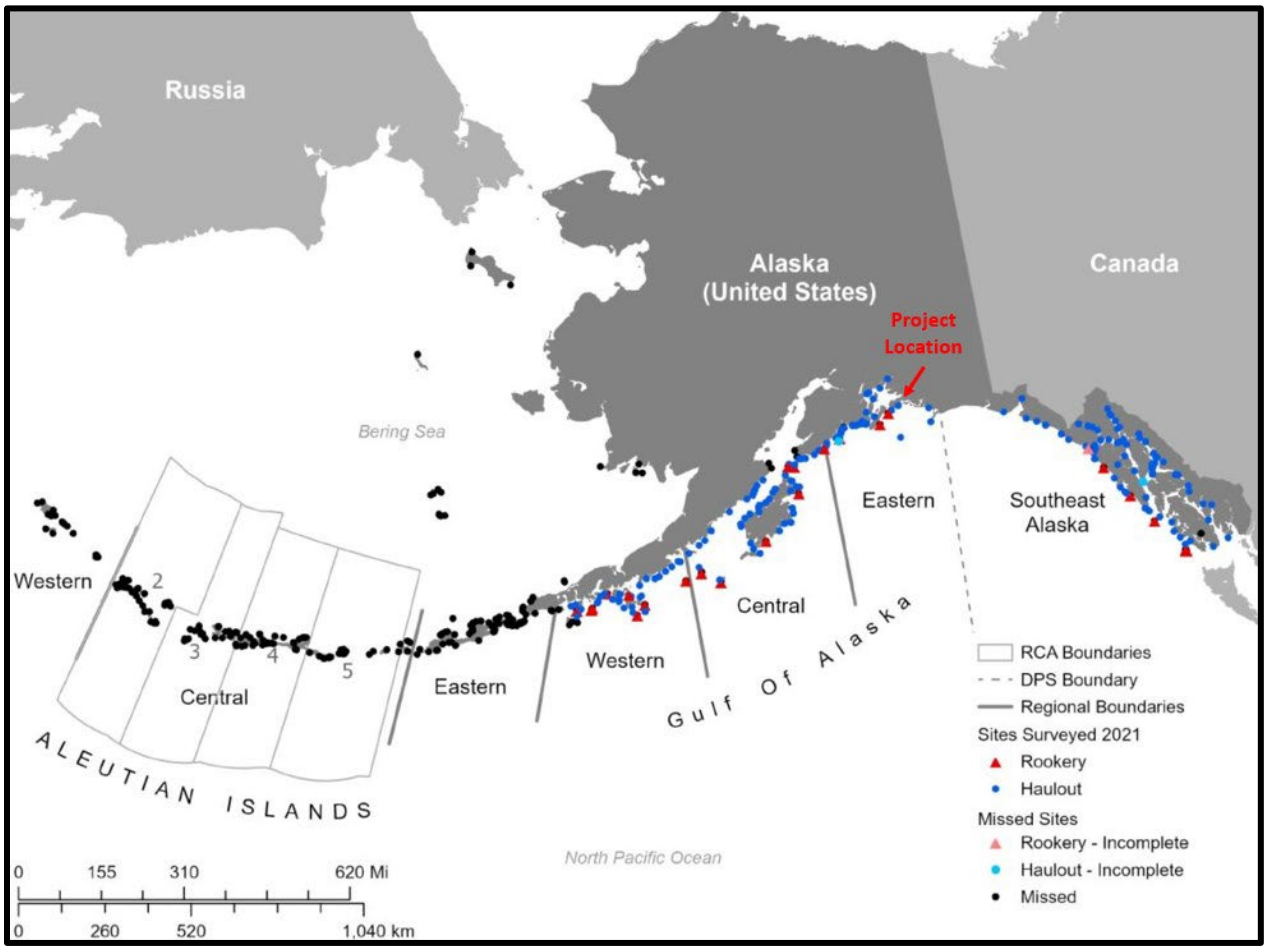

Figure 11. Steller Sea Lion Rookeries and Haulouts.

4.3.1.3 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. Project vessels will transit through Steller sea lion critical habitat in Prince William Sound and the Gulf of Alaska; the materials and construction barges may also travel in proximity to Steller sea lion critical habitat in Southeast Alaska.

Orca Inlet

Steller sea lions are distributed throughout Southcentral Alaska, with patterns loosely correlated

to aggregations of spawning and migrating prey species (Sinclair and Zeppelin 2002, Sinclair, Johnson et al. 2013). Orca Inlet has several anadromous streams that support salmon species and six processing plant outfalls that also attracts Steller sea lions.

Steller sea lions may be found in and around Orca Inlet throughout the year. Additionally, communication with the Cordova Harbormaster and scientists at the Prince William Sound Science Center indicated that Steller sea lions are occasionally observed inside Cordova Harbor (Solstice 2023)

The Steller sea lion rookery nearest to this project is on Seal Rocks, located in the Hinchinbrook Entrance between Hinchinbrook and Montague Islands, 73 km southwest of the project site (Figure 8). The nearest major haulouts are Cape Hinchinbrook located on Hinchinbrook Island, approximately 60 km southwest of the project site, and Hook Point also located on Hinchinbrook Island, 37 km southwest of the project site. The extent of the action area for pile driving activities overlaps with Steller sea lion critical habitat.

4.3.1.4 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 2008), and occasionally other marine mammals and birds (Pitcher and Fay 1982, NMFS 2008).

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 2008). 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 animals that often travel in large groups of up to 45 individuals (Keple 2002), and rafts of several hundred Steller sea lions are often seen adjacent to haulouts. Individual rookeries and haulouts may be comprised of hundreds of animals. At sea, groups usually consist of females and subadult males as adult males are usually solitary (Loughlin 2002).

4.3.1.5 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 2018). Studies of Steller sea lion auditory sensitivities have found that this species detects sounds underwater between 1 and 25 kHz (Kastelein, Van Schie 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.

4.3.1.6 Threats

Natural Threats

Killer whale predation on the Western DPS, under reduced population size, may cause significant reductions in the stock (NMFS 2008). 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, Burns 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, Helker 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, Young 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. Illegal shooting of Steller sea lions continues to be a threat to animals in the Cordova area.

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, Castellini et al. 2013).

4.3.2 Sunflower Sea Stars

Sunflower sea stars are one of the largest sea stars in the world, reaching more than 1 meter in diameter and 8 kg in weight (Jewett, Clark et al. 2015). They are also one of the fastest species of sea stars, moving up to 1.6 m per minute and are also characterized by having many arms (15-24) (Jewett, Clark et al. 2015). The species was proposed to be listed as threatened throughout its range on March 16, 2023 (88 FR 16212) following significant range wide declines in abundance due to a pandemic likely caused by an unknown pathogen (Lowry 2022). NMFS has not proposed critical habitat at this time.

4.3.2.1 Population Structure and Status

Prior to 2013, the global abundance of sunflower sea star was estimated at several billion animals, but from 2013–2017 sea star wasting syndrome (SSWS) reached pandemic levels, killing an estimated 90 % or more of the population (Lowry 2022). Sunflower sea stars are currently estimated to number approximately 600 million (Lowry 2022). Declines in the northern portion of its range (i.e., Alaska and British Columbia) were less pronounced than in the southern portion, but still exceeded 60 %. Species-level impacts from SSWS, both during the pandemic and on an ongoing basis, have been identified as the major threat affecting the long-term persistence of the sunflower sea star (Lowry 2022).

Recent counts in some areas of Alaska, including western Prince William Sound, showed a big increase in 2022 (Heather Coletti, Dan Esler et al. 2023). The density of sunflower sea stars in western Prince William Sound in 2022 are similar to what was observed prior to the recent SSWS pandemic (S. Traiger, pers. comm.).

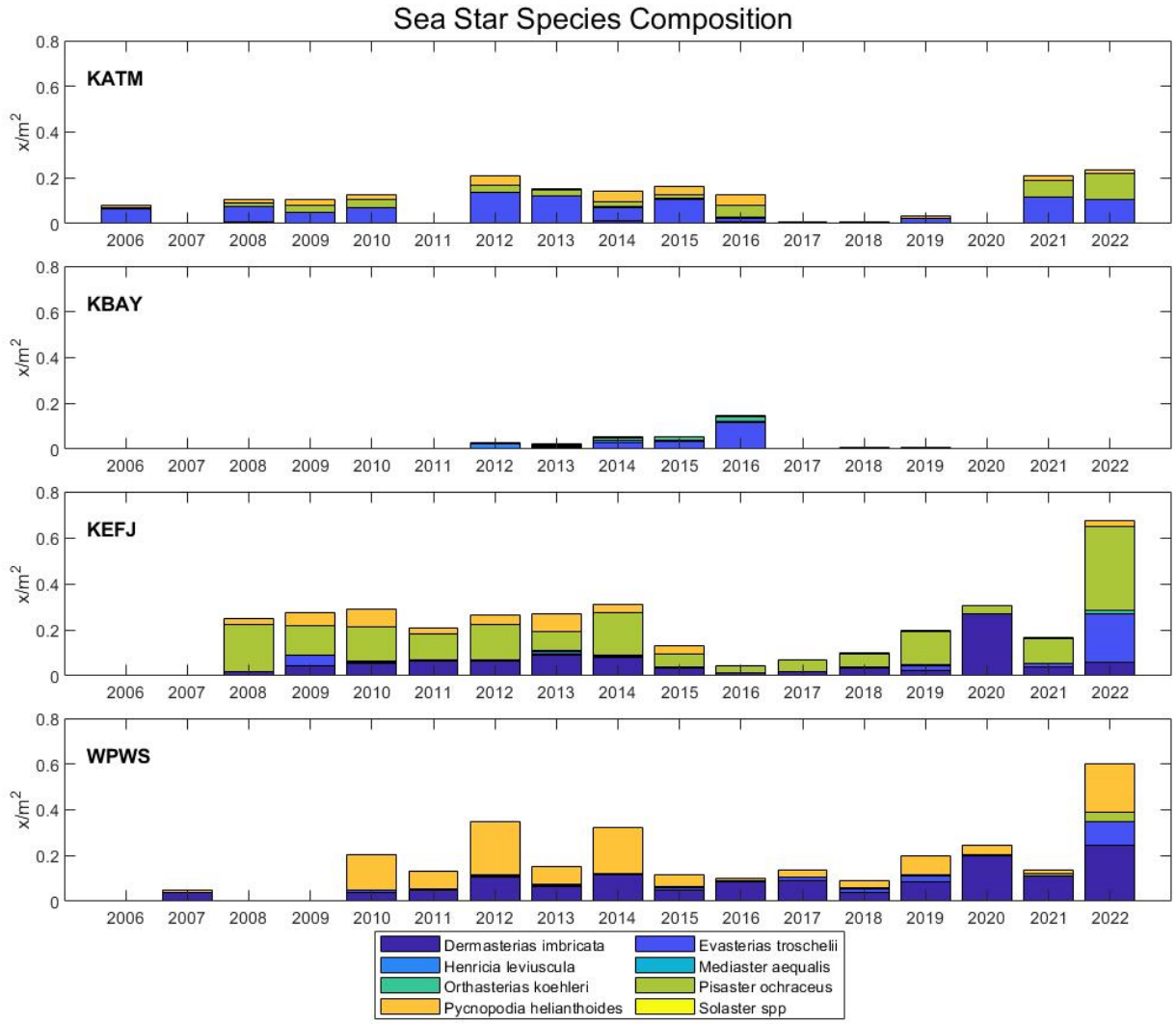

Figure 12. Sea star densities in Katmai (KATM), Kachemak Bay (KBAY), Kenai Fjords (KEFJ), and western Prince William Sound (WPWS) from 2006-2022. Sunflower sea stars (*P. helianthoides*) shown in orange (Heather Coletti, Dan Esler et al. 2023).

4.3.2.2 Distribution and Habitat Use

Sunflower sea stars occur in a wide range of intertidal and subtidal habitats from northern Baja California, Mexico to the central Aleutian Islands, Alaska (Jewett, Clark et al. 2015, Gravem, Heady et al. 2021, Lowry 2022). It occupies waters from the intertidal to at least 435 m deep, but is most common at depths less than 25 m and rare in waters deeper than 120 m (Lambert 2000, Hemery, Marion et al. 2016, Gravem, Heady et al. 2021). Sunflower sea stars occur over a broad array of soft-, mixed-, and hard-bottom habitats, and are most abundant in Alaska and British Columbia (Gravem, Heady et al. 2021).

They are found along the outer coasts and inside waters, which have complex geophysical features including glacial fjords, sounds, embayments, and tidewater glaciers. Preferring temperate waters, they inhabit kelp forests and rocky intertidal shoals (Shivji, Parker et al. 1983, Lowry 2022), and are regularly found in eelgrass meadows as well (Dean and Jewett 2001, Gravem, Heady et al. 2021).

4.3.2.3 Threats to the Species

Brief descriptions of threats to sunflower sea stars follow. More detailed information can be found in the draft ESA Status Review report for the species(Lowry, Wright et al. 2022) Sea Star Wasting Syndrome (SSWS)

Sea star wasting syndrome is the primary threat identified to the sunflower sea star in the proposed threatened listing rule (50 CFR 16212). Beginning in 2013, SSWS caused ~72-100% declines in locally monitored populations of *P. helianthoides* across its range. The global *P. helianthoides* population declined by an estimated 90.6% due to SSWS (Gravem, Heady et al. 2021, Lowry 2022). Recent laboratory studies suggest that *P. helianthoides* die as quickly as 2-4 days after exposure to SSWS (A. Gehman, pers. comm.).

The causative agent of SSWS is currently unknown and various hypotheses regarding transmission dynamics and the lethality of SSWS under diverse physiochemical conditions exist. A number of factors ranging from environmental stressors to the microbiome in sea stars may play a role (Lloyd and Pespeni 2018, Konar, Mitchell et al. 2019, Aquino, Besemer et al. 2021). Ocean warming has also been linked to SSWS outbreaks, hastening disease progression and severity (Harvell, Montecino-Latorre et al. 2019, Aalto, Lafferty et al. 2020).

Bycatch/Overexploitation

Sunflower sea stars are not the object of targeted commercial fisheries historically or currently. Bycatch mortality from trawl and bottom-contact trap/pot fisheries pose a low-level risk now and potentially a higher level of future risk, especially in areas where populations are declining or already at very low levels (Lowry 2022). Recreational harvest of *P. helianthoides* is permitted in British Columbia, Alaska, and California, and is unrestricted in Mexico, but estimates of recreational harvest are not available (Lowry 2022, ADFG 2023). Evidence does not exist for regular human consumption of the species, so all collection is assumed to be for private exhibition, use, or curiosity.

Pollution/Discharge

The Status Review Team was concerned about the impacts that pollutants and contaminants might have on the ecosystems upon which *P. helianthoides* depend, in particular the food that they eat (Lowry 2022). Pollutants could potentially weaken the microbiome or immune response of the sunflower sea star, leading to mortality (Aquino, Besemer et al. 2021, McCracken, Christensen et al. 2023).

Coastal Development

Impacts to the benthic environment from coastal development activities such as dredging, pile driving, use of heavy equipment, and runoff of pollutants into the marine environment are a potential threat to sunflower sea stars. Sedimentation, erosion, and sea level rise have the potential to produce more widespread impacts, especially in coastal environments near urban development (Lowry 2022). Log booms could create localized habitat destruction as water-soaked bark rains down a river into coastal waters, creating anoxic areas (Gravem, Heady et al. 2021, Lowry 2022).

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).

This section discusses the environmental baseline, focusing on existing anthropogenic and natural activities within and near the action area and their influences on listed species may be adversely affected by the proposed action. Species that may be affected by the proposed action include Western DPS Steller sea lions. Although some of the activities discussed below are outside the action area, they may still have an influence on listed species or their habitat in the action area.

5.1 Climate Change

Cordova has a moderate maritime climate protected by surrounding mountain ranges. Extreme cold temperatures are rare and short-lived, but high winds are experienced. During typical winters, alpine snows are retained enough to support a ski resort, but the harbor remains ice free. Steller sea lions are present in Prince William Sound throughout the year, but are most frequently observed near Cordova in the fall & winter.

All areas of the action area are being affected by climate change. Although the species living in the Arctic successfully adapted to changes in the climate in the past, the current rate of change is accelerated (Simmonds and Eliott. 2009). As described in Section 4.2, effects to Arctic ecosystems are very pronounced, wide-spread, and well documented. While a changing climate

may create opportunities for range expansion for some species, the life cycles and physiological requirements of many specialized polar species are closely linked to the annual cycles of sea ice and photoperiod and they may be less adaptable (Doney, Fabry et al. 2009, Wassmann, Duarte et al. 2011). Because the rate of change is occurring so quickly, the changes may exceed species' ability to adapt.

Indirect threats associated with climate change include increased human activity as a result of regional warming. 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.

As discussed in Section 4.2, the Pacific marine heatwave is 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 of Pacific cod was at its lowest point in the 41-year time series considered. This assessment was conducted following three years of poor recruitment and increased natural mortality during the Gulf of Alaska marine heat wave from 2014 to 2016 (NMFS 2018).

The Steller Sea Lion Recovery Plan ranks environmental variability as a potentially high threat to recovery of the Western DPS (NMFS 2008). The Gulf of Alaska is 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 2008). Populations of Steller sea lions in the Gulf of Alaska have experienced large fluctuations due to environmental and anthropogenic forcing (Mueter, Broms et al. 2009).

5.2 Natural Catastrophic Changes

Steller sea lions inhabit regions of known seismic and volcanic activity and tsunami events. Earthquakes, volcanic eruptions, landslides, and tsunamis can alter the physical environment instantaneously. Catastrophic events are infrequent but have the potential to impact marine mammals by: decreasing prey abundance as a result of direct mortality; rendering habitat unsuitable (or more suitable) for marine mammals and prey species; directly removing (or creating) habitat areas (e.g., elevation changes, landslides, and tsunamis could remove (or create)

haulouts and rookeries or alter access to habitat); and, degrading habitat quality (e.g., volcanic ash outfall could affect siltation and water chemistry; NMFS 2016). To date, natural catastrophes are not known to have impacted these species.

5.3 Biotoxins

As temperatures in the Arctic waters warm and sea ice diminishes, marine mammal health may be compromised through nutritional and physiological stress, toxins from harmful algal blooms, and exposure to new pathogens. An unprecedented harmful algal bloom extended from the Aleutian Islands to southern California as a result of the Pacific marine heatwave causing mass strandings of marine mammals (Cavole, Demko et al. 2016). Fey, Siepielski et al. (2015) found that across all animal taxa biotoxicity from harmful algal blooms was one of the events most often associated with mass mortality events. Two of the most common biotoxins along the West Coast of the Pacific are the neurotoxins domoic acid and saxitoxin (Lefebvre, Quakenbush et al. 2016). Although these toxins can cause death, they can also cause sublethal effects including reproductive failure and chronic neurological disease (Broadwater, Van Dolah et al. 2018).

Domoic acid was first recognized as a threat to marine mammal health in 1998 when hundreds of California sea lions (*Zalophus californianus*) died along beaches in central California or exhibited signs of neuroexcitotoxicity including seizures, head weaving, and ataxia (Scholin, Gulland et al. 2000). Along the west coast of the United States and Canada, a coastwide bloom of the toxigenic diatom *Pseudo-nitzschia* in spring 2015 resulted in the largest recorded outbreak of domoic acid. Record-breaking concentrations of the marine neurotoxin caused unprecedented widespread closures of commercial and recreational shellfish and finfish fisheries and contributed to the stranding of numerous marine mammals along the U.S. west coast (McCabe, Hickey et al. 2016).

Lefebvre, Quakenbush et al. (2016) examined 13 species of marine mammals from Alaska including humpback whales, bowhead whales, beluga whales, harbor porpoises, northern fur seals, Steller sea lions, harbor seals, ringed seals, bearded seals, spotted seals, ribbon seals, Pacific walruses, and northern sea otters (Figure 20). Domoic acid was detected in all 13 species examined and had the greatest prevalence in bowhead whales (68%) and harbor seals (67%). Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales (50%) and bowhead whales (32%) and 5% of the animals tested had both toxins present (Lefebvre, Quakenbush et al. 2016). It is not known if exposure to multiple toxins result in additive or synergistic effects or perhaps suppress immunity to make animals more vulnerable to secondary stressors (Broadwater, Van Dolah et al. 2018).

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

5.4 Vessel Traffic

The action area experiences high levels of small marine charter and commercial fishing vessels and recreational marine vessel traffic during the summer season. Cordova's economy is closely tied to the city's commercial fishing fleet, with 600 to 7000 commercial fishing vessels registered to residents annually (Solstice 2023). Passenger ferries, barges, freight vessels, and occasional cruise ships also travel near the project action area. There are six seafood processing plants in Cordova which contribute to vessel traffic during the commercial salmon fishing season (Solstice 2023).

Prince William Sound hosts multiple active marine shipping routes for critical goods and services which includes crude oil exported from the Valdez Marine Terminal and cargo loads delivered to Whittier (Solstice 2023). Tanker traffic transporting crude oil from the Valdez Marine Terminal in Prince William Sound is limited to the narrow Hinchinbrook Entrance (Solstice 2023). Additionally, Alaska Marine Highway System Ferries are active in Prince William Sound connecting Cordova and other remote communities with the road system (ADOT&PF 2023).

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 at least 108 recorded whale-vessel collisions in Alaska, with the majority occurring in Southeast Alaska between May and September (Neilson, Gabriele 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, Gabriele et al. 2012).

The majority of vessel strikes involved humpback whales (86 %) and the number of humpback strikes increased annually by 5.8 % from 1978 to 2011. Seventeen humpback whales were reported struck by vessels between 2013 and 2015 (Delean, Helker et al. 2020), and 18 humpbacks were reported struck by vessels between 2016 and 2020 (Freed, Young et al. 2022) in Alaskan waters. There have been nine reported ship strikes in PWS between 2000 and 2021. Six of the strikes involved humpback whales and the other three involved unidentified large whales. Of the known vessel types involved, four were categorized as personal sport/recreational vessels and two were commercial recreational vessels. +

Vessel traffic in the action area- and the surrounding area- poses varying levels of threat to Steller sea lions, depending on the type and intensity of the shipping activity and its degree of spatial and temporal overlap with habitats. The presence, movements, and sound of ships in the vicinity of Steller sea lions may cause them to abandon breeding or foraging areas.

5.5 Fisheries

NMFS considers competition with fisheries to be a threat to Steller sea lions that may have a potentially high impact on recovery of the species (Muto et al. 2022). The Steller Sea Lion Recovery Plan (NMFS 2008) noted there are commercial fisheries that target key Steller sea lion prey, including Pacific cod, salmon, and herring in the eastern portion of their range. It was recognized that in some regions, fishery management measures appear to have reduced this potential competition (e.g., no-trawl zones and gear restrictions on various fisheries in Southeast Alaska), and in others a very broad distribution of prey and a lack of seasonal overlap between fisheries and prey preference by sea lions may minimize competition as well.

5.6 Entanglement

Although the Steller Sea Lion Recovery Plan (NMFS 2008) ranked interactions with fishing gear and marine debris as a low threat to the recovery of the Western DPS, the extent of this threat may not be fully known because some entangled sea lions may be unable to swim to shore once entangled, may die at sea, and may not be available to count (Loughlin and Nelson Jr. 1986, Raum-Suryan, Jemison et al. 2009). The main cause of reported human-marine mammal interaction serious injury and mortality to in Alaska between 2013-2017 was entanglement/entrapment, and Steller sea lions were the most common species of human-caused mortality and serious injury (Delean, Helker et al. 2020). There were 105 cases of serious injury

and mortality to Western DPS Steller sea lions from interactions with fishing gear and marine debris.

The minimum estimated mortality rate of Western DPS Steller sea lions incidental to all US commercial fisheries (averaged from reports in 2014-2018) is 37 sea lions per year (Muto, Helker et al. 2022).

5.7 Pollution

A number of intentional and accidental discharges of contaminants pollute the marine waters of Alaska annually. Intentional sources of pollution, including domestic, municipal, and industrial wastewater discharges (e.g., there are six permitted discharges from seafood processing plants in the City of Cordova), are managed by the Alaska Department of Environmental Conservation. Pollution may also occur from unintentional discharges and spills.

Marine water quality in the action area can be affected by discharges from treated sewer system outflows, vessels operating in marine waters, and sediment runoff from paved surfaces and disturbed areas. Large fuel spills are also possible from large vessel groundings, particularly high fuel capacity ships or barges transporting fuel.

Orca Inlet is a relatively shallow waterbody with limited freshwater input. As a result, it tends to be well-mixed with consistent temperature and salinity throughout, assisting with moderating potential impacts from fishery outfalls. Additionally, Orca Inlet did not directly receive oiling during the Exxon Valdez oil spill (EVOS) as a result of prevailing winds and currents (PND 2021).

5.8 Coastal Zone Development

Coastal zone development results in some loss and alteration of nearshore marine species habitat and changes in habitat quality. Increased development may prevent marine mammals from reaching or using important feeding, breeding, and resting areas. The project action area is entirely within a previously industrialized area. The shoreline in the immediate project area is primarily developed directly adjacent to the shoreline of the project footprint within Cordova Harbor. The shoreline immediately adjacent to the project site has been previously disturbed and heavily developed, with man-made industrial structures including six seafood processing plants, the Cordova Ferry Terminal, and various commercial, public, and residential buildings. Due to limited available space, there is little opportunity for further development (Solstice 2023).

Shoreline development outside the Cordova Harbor is limited by the few miles of road in the community. Of the approximately 10 miles (16 kilometers) of shoreline along the road system in Cordova, approximately 3 miles (5 kilometers) have been developed. The shoreline of Orca Inlet and Orca Bay outside of the road system remains primarily pristine and unaltered (Solstice 2023).

5.9 Stressors on Sunflower Sea Stars

(SSWS is the primary threat and stressor to sunflower sea stars across their range. SSWS is thought to be exacerbated by warming ocean temperatures and other climate change related characteristics. Other potential stressors in the action area include pollution, bycatch/overexploitation, and coastal development activities.

5.9.1 Sea Star Wasting Syndrome

A SSWS pandemic occurred across the range of the sunflower sea star from 2013-2017. SSWS is known to occur in sunflower sea stars and other species at smaller geographic and temporal scales, and is expected to occur in the future. But the magnitude of future outbreaks is unknown. The pathogen that caused the 2013-2017 is unknown. As stated above, the draft 2022 Status Review Report for this species identified SSWS as the factor of greatest concern for the species throughout its range, including in the action area.

5.9.2 Climate Change

Climate change is anticipated to lead to warming ocean temperatures, more extreme fluctuations in ocean temperatures, and more storm events. These characteristics may exacerbate SSWS events in sunflower sea stars, or result in marine habitat or ecological shifts that negatively affect the species (Lowry 2022). Warming ocean temperatures, extreme fluctuations in ocean temperature, harmful algal blooms, ocean acidification, and low dissolved oxygen events, all byproducts of anthropogenic climate change, could impose direct and indirect stress on *P. helianthoides* and increase their vulnerability over the coming decades. There is uncertainty regarding causal links between climate change and impacts to *P. helianthoides*, and the scale over which these potential impacts are taking place. For example, local temperature-related stress, low dissolved oxygen events, and harmful algal blooms may be buffered by the refuge that a broad geographic and depth range provides to this species.

5.9.3 Pollution

Pollution into the marine environment from runoff, spills, or outfall pipes may compromise the microbiome of sunflower sea stars leading to death, or making them vulnerable to other stressors (Aquino, Besemer et al. 2021, McCracken, Christensen et al. 2023). Relative to SSWS, this is minor threat that is limited in spatial and temporal scope. There is no direct evidence that this stressor is directly impacting sunflower sea stars in the action area.

5.9.4 Bycatch/Overexploitation

Sunflower sea stars are likely caught in small numbers as bycatch in pot gear in the action area. Most of these are likely returned to the marine environment without serious injury. Handling stress in sea stars is not well understood, but is not likely to be significantly impacting the species in the action area. Some individuals may be collected for curiosity by the public in the

action area, but these numbers are expected to be small and may not result in significant stress if the animals are quickly returned to the marine environment.

5.10 Prior Section 7 Consultations

There have been no recent formal Section 7 consultations conducted for projects in the Cordova area. Since 2017, several informal Section 7 consultation have occurred in or near the Cordova Harbor project area (Table 6). The most common stressor among these consultations was acoustic disturbance.

Table 6. Recent informal Section 7 consultations near the Cordova Harbor action area.

Title	ID
Cordova Trident Dock Addition	AKRO-2017-00961
Orca Inlet Trident Dock Replacement	AKRO-2018-00141
DOT PF Cordova Deep Culverts (reinitiation)	AKRO-2019-01885
Cordova Mooring Dolphin Repair	AKRO-2021-01429
Cordova Harbor Geotechnical Survey*	AKRO-2022-00827
Whitshed Road and Pedestrian Improvements	AKRO-2022-01527

*this geotechnical survey was conducted as part of this Cordova Harbor Rebuild project, and the records are linked in the Environmental Consultation Organizer (ECO) at https://appscloud.fisheries.noaa.gov/suite/sites/eco/page/home

5.11 Environmental Baseline Summary

Several of the activities described in the Environmental Baseline have adversely affected listed species that occur in the action area:

- There are insufficient data to make reliable estimations of the impact of climate change

on marine mammals considered in this opinion. 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.

- Vessel traffic in the action area poses varying levels of threat to the listed marine mammals, depending on the type and intensity of the shipping activity and its degree of spatial and temporal overlap with habitats. The presence, movements, and sound of ships in the vicinity of some species may cause them to abandon breeding or foraging areas.
- Commercial fisheries may have reduced prey availability.
- Steller sea lions have been impacted by entanglement.
- The proposed project is in an area of moderately high human use and some existing habitat alteration.
- Some sunflower sea stars are caught as bycatch in pot gear and released.
- SSWS dramatically decreased the numbers of sunflower sea stars throughout its range, including in the action area.
- Climate change is thought to exacerbate SSWS, which was the cause of a range wide die-off of sunflower sea stars.

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 Biological Assessment; the IHA application; the proposed notice for issuing the IHA; personal communications with PR1, the non-federal designee, and others; and other available literature as referenced in this opinion, our analysis recognizes that the Cordova Harbor rebuild project may cause these primary stressors:

1. in-water sound fields produced by impulsive and non-impulsive noise sources related to pile driving activities including vibratory pile driving, impact pile driving, and down-the-hole drilling;
2. in-air sound fields produced by impulsive noise sources such as impact pile driving;
3. vessel strike and disturbance;
4. disturbance to prey and/or habitat including seafloor disturbance from pile driving activities and placement of equipment or anchors, turbidity and sedimentation;
5. entanglement in mooring lines, trash and debris;
6. pollution from unauthorized spills; and
7. impacts to sunflower sea stars from dredge and fill operations, and removal from the water during pile extraction.

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 Western DPS Steller sea lions.

6.1.1.1 In-air sound

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

- 100 dB re 20μPa_{rms} for non-harbor seal pinnipeds

While Western DPS Steller sea lions may be exposed to in-air noise from the pile driving

activities, a standard sound attenuation model suggests that sound generated from pile driving and DTH will attenuate to the 100db rms criterion within 22.8m from the pile. Since this in-air noise is calculated for sea lions *in the water*, this in-air noise impact is expected to be minimal. Any Western DPS Steller sea lions exposed to the in-air sound of the project will only be exposed after swimming into and surfacing within the ensonified area. Any Western DPS Steller sea lion close enough to the sound source to be considered a 'take' from in-air noise associated with pile driving will already have been accounted for by in-water take, or that take could have been avoided due to the proposed mitigation measures. Thus, any effects from in-air noise on Western DPS Steller sea lions is likely minimal.

6.1.1.2 Vessel strike

As discussed in the Environmental Baseline section, Orca Inlet experiences moderate levels of vessel traffic year-round, with a seasonal summer increase. Vessel traffic is primarily from commercial fishing vessels, recreational vessels, barges, passenger ferries, cruise ships and freight vessels.

There may be a temporary, localized, and small increase in vessel traffic during construction.

Transport of materials and equipment and of workers to and from construction site

Prior to each phase of construction, the material barge will transport materials from Washington State and the construction barge will travel from Juneau in Southeast Alaska to the project site (Figure 4 and Figure 5).

The barges will travel at a rate of approximately 6 knots and follow well-established, frequently utilized navigation lanes. Upon arrival, the barge will remain moored or will be repositioned very slowly. Skiffs will transport workers short distances, mostly within the harbor.

Vessel traffic is expected to remain approximately the same upon completion of the Cordova Harbor Rebuild project. The number of slips in the South Harbor will decrease from 506 to 446, and the number of slips in the North Harbor will remain the same at 205. The purpose of this project is to improve Cordova's Harbor to offer safe vessel mooring and better accommodate the current and future commercial fishing industry and associated freight by addressing safety risks and access issues identified in a 2016 assessment of the facilities.

The possibility of vessel strike associated with the proposed action is extremely unlikely. Vessel operations for construction occur at relatively low speed limits (5 knots). Once vessels get to the construction site, they will be moving very slowly for very short distances. Due to the common presence of commercial and recreational vessels in the action area and the relatively small number of vessel transits during the duration of the project, the use of slow-moving tugboats and barges and skiff transits associated with construction of the project is not anticipated to measureably affect ESA-listed species.

Although risk of vessel strike has not been identified as a significant concern for Steller sea lions (Loughlin and York 2000), the Recovery Plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated (e.g., near rookeries or haulouts) (NMFS 2008). Since 2000, there have been four reported vessel strikes of Steller sea lions within Southeast Alaska, and one in Southcentral Alaska near Homer prior to 2000.

Vessel strike conclusion

Although the water near the Cordova Harbor has high volumes of vessel traffic, the likelihood of a vessel strike as a result of the proposed action is low. Mitigation measures are in place to reduce the risk of ship strike (e.g., marine mammal avoidance measures). All vessels will be required to observe the Alaska humpback whale approach regulations (100 yards), which will further reduce the likelihood of interactions.

In general, the association in space and time of project-related vessels and humpback whales and Steller sea lions is highly unlikely because 1) vessel traffic associated with the proposed action will be minimal, and 2) vessel speeds will be low. In addition, NMFS's regulations for approaching humpback whales require that vessels not approach within 100 yards. All of these factors limit the risk of strike and minimize vessel noise near marine mammals. We conclude the probability of strike occurring is extremely unlikely and therefore effects are highly improbable.

6.1.1.3 Vessel noise

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. The source levels for project vessels are estimated at between 145–170 dB rms, and will drop to 120 dB within 2,154 meters (or less) of the source (Richardson, Greene Jr et al. 1995, Blackwell and Greene 2003, Ireland and Bisson 2016).

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, because vessels will be in transit, the duration of the exposure to ship noise 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.

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. 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, Bain et al. 2002, Lusseau 2003, Lusseau 2006). Studies indicate that dive times and swimming speeds increase, vocalizations and jumping usually decrease, and individuals in groups move closer together (Kruse 1991, Evans, Carson 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. Responding to vessels is likely stressful to humpback whales, but the biological significance of that stress is unknown (Bauer and Herman 1986).

Humpback cow-calf pairs significantly reduced the amount of time spent resting and milling when vessels approached, as compared to undisturbed whales (Morete, Bisi et al. 2007).

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 2008). 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 2008). 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 habituated to vessel disturbance due to the common presence of ferries, cruise ships, fishing vessels, barges, tugboats, and other commercial and recreational vessels that use the harbor. 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.

In summary, some marine mammals could 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 transiting 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.

6.1.1.4 Disturbance to seafloor, habitat and/or prey resources related to marine mammals

The proposed activities will not result in permanent impacts to habitats used directly by marine mammals. The total seafloor area likely impacted by the project is relatively small compared to the available habitat in Southcentral 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 marine mammals. Additionally, the total seafloor area affected by dredge and fill operations, and 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 will not obstruct movements or migration of marine mammals.

The proposed action will have temporary impacts on water quality (increases in turbidity levels) and on prey species distribution.

Cordova Harbor is already currently a turbid and developed area. Pile driving may cause temporary and localized turbidity through sediment disturbance. Turbidity plumes during pile installation and removal will be localized around the pile; turbidity associated with pile installation is localized to about a 7.6 m radius around the pile (Everitt, Fiscus et al. 1980). DTH drilling will release drill cuttings into the marine environment and increase turbidity in the immediate area. Dredge and fill operations will result in a temporary and localized increase in turbidity for the short duration of that phase of the project.

Humpback whales are not expected to be close enough to the pile driving areas to experience the effects of turbidity, and Steller sea lions can easily avoid localized areas of turbidity at no measurable cost to them. Local strong currents are expected to disperse any additional suspended sediments produced by project activities at moderate to rapid rates depending on tidal stage. Due to temporary, localized, and low levels of turbidity increases, it is not expected that turbidity will result in immediate or long-term effects to the Mexico DPS and WNP DPS of humpback whale, Western DPS Steller sea lion or their prey.

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

The most likely impact to fish from pile driving and drilling activities at the project area will be

temporary behavioral avoidance of the 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 will 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 and DTH drilling operations. We consider potential adverse impacts to prey resources from construction activities in the action area to be immeasurably small.

Studies on euphausiids and copepods, two of the more abundant and biologically important groups of zooplankton, have documented some sensitivity of zooplankton to sound (Chu, Sze et al. 1996, Wiese 1996); however, any effects of pile driving and drilling activities on zooplankton will be expected to be restricted to the area within a few feet or meters of the project and will likely be sub-lethal.

While previous studies concluded that crustaceans (such as zooplankton) are not particularly sensitive to sound produced by even louder impulsive sounds such as seismic operations (Wiese 1996), a recent study provides evidence that seismic surveys may cause significant mortality (McCauley, Day et al. 2017). However, seismic surveys are significantly louder and lower frequency than the sound sources associated with this project and are not directly comparable.

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 and the relatively small areas being affected, pile driving activities associated with the proposed action are not likely to have a significant 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.

6.1.1.5 Entanglement in mooring lines, trash and debris

A small number of anchor, towing, and moorage lines will be put in the water column as part of the work associated with the proposed action. There is a precedent for humpback whales becoming entangled in anchor and mooring in Southeast Alaska near the action area, particularly when the lines are novel, or new to the whales. However, due to in-water noise associated with the project that will let the whales and sea lions know there is new activity occurring in the area, the small number of lines associated with the project, and with the implementation of General

Mitigation Measures #3 and #4 dealing with the proper disposal of project generated waste, the risk of entanglement is low and effects are thus extremely unlikely.

6.1.1.6 Pollution

While there is potential for an oil or pollutant spill from activities associated with the project, the risk of spills and pollutants related to the project will be mitigated by implementing best management practices and policies to prevent accidental spills. Plans will be in place and materials will be available for cleanup activities if a spill were to occur.

During dredging, sediment will be displaced or removed. Contamination from dredging is always a concern; however, USACE maintains an ongoing dredging program within the harbor independent of this project. Additionally, the City of Cordova will address any soil testing requirements during the USACE permitting process for this project. Alternative disposal of dredged soils will be addressed if contamination was identified from any pre-construction testing (Solstice 2023).

Construction will be conducted in accordance with Clean Water Act Section 404 and 401 regulations to minimize potential construction-related impacts on water quality, and any effects to Mexico and WNP DPS humpback whales and Western DPS Steller sea lions will be immeasurably small. Therefore, we conclude that the effects from this stressor are negligible.

6.1.2 Major Stressors on ESA-Listed Species

While humpback whales and fin whales have been documented in Prince William Sound, the temporal and/or spatial occurrence of these species is such that take is not expected to occur. These species are considered to be rare (no sightings in recent years) or very rare (no local knowledge of sightings within the project vicinity) within Orca Bay according to the Prince William Sound Science Center in Cordova (Solstice 2023). Given the shallow depths of the waters surrounding Cordova Harbor, it will also be unusual for many of these species to enter the project area, and these species are not considered further in this opinion.

The following sections analyze the stressors likely to adversely affect Western DPS Steller sea lions due to underwater anthropogenic sound. 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,[8] expressed in root mean square[9] (rms), from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the Marine Mammal Protection Act (MMPA) (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 3) 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 2018). Different thresholds and auditory weighting functions are provided for different marine mammal hearing groups, which are defined in the Technical Guidance (NMFS 2018). The generalized hearing range for each hearing group is in Table 7.

[8] 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.

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

Table 7. 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 *(Baleen whales)*	Bowhead whales	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans *(dolphins, toothed whales, beaked whales)*	None	150 Hz to 160 kHz
High-frequency (HF) cetaceans *(true porpoises)*	None	275 Hz to 160 kHz
Phocid pinnipeds (PW) *(true seals)*	Ringed and bearded seals	50 Hz to 86 kHz
Otariid pinnipeds (OW) *(sea lions and fur seals)*	None	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[10] associated with NMFS Acoustic Guidance, or through modeling.

[10] The Optional User Spreadsheet can be downloaded from the following website: http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm

Table 8. 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 $L_{E,LF,24h}$: 183 dB	$L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	$L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	$L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	$L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	$L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	$L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	$L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	$L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	$L_{E,OW,24h}$: 219 dB

[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 $1\mu Pa^2s$. The subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

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 in Section 6.2, we anticipate that exposures to Western DPS Steller sea lions from noise associated with the proposed action may result in disturbance and potential injury from a small degree of PTS. No serious injury or mortalities are anticipated with this project.

6.1.3 Major Stressors on Sunflower Sea Stars

New permanent and temporary pilings will come in contact with the benthic environment prior to being driven. In addition, marine invertebrates such as mussels and barnacles, have likely settled and grown on the pilings that will be removed as part of the action description. These are prey items for sunflower sea stars, and it is possible that a few individual sea stars will be attracted onto the pilings prior to pilings removal.

Activities impacting the benthic environment due to pile driving and removal may interact with sunflower sea stars on the sea floor or on the pilings that will be removed. Pilings could potentially come in contact with sea stars, or sunflower sea stars could be brought to the surface on pilings when they are removed from the water.

Additionally, sunflower sea stars could be affected by dredging or fill activities associated with this project. Approximately 22,000 cubic yards will be dredged from 1.5 acres (6,000 $m^{2)}$ of the North Harbor. Placement of 47,300 cubic yards of fill (dredge soil + imported gravel) will be placed in the North Harbor and 670 cubic yards of fill will be placed at the boat launch of the South Harbor. These activities have the potential to directly impact (e.g., harm, wound, kill, collect) sunflower sea stars, as well as impacting sunflower sea star habitat.

6.2 Exposure Analysis for Western DPS Steller sea lions

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 gender 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, MARAD proposed mitigation measures that should avoid or minimize exposure of Western DPS Steller sea lions to one or more stressors from the proposed action.

6.2.1 Exposure to noise from pile driving activities

Western DPS Steller sea lions may be present within the waters of the action area during the time

that the in-water work is being conducted and could be exposed to temporarily elevated underwater noise levels resulting in harassment. Temporarily elevated underwater noise during pile driving activities (including vibratory pile driving and impact pile driving) has the potential to result in Level B (behavioral) and Level A harassment (resulting in injury). While shutdown zones will be implemented (Appendix A), these zones do not cover the entire ensonified zone for Level A harassment. However, degradation of hearing capabilities within regions of hearing that align most completely with the energy produced by impact pile driving (such as the low frequency region below 2 kHz) is not expected to result in severe hearing impairment or impairment within the ranges of greatest hearing sensitivity. Animals would need to be exposed to higher levels and/or longer duration than are expected to occur here in order to incur any more than a small degree of PTS. The Marine Mammal Monitoring and Mitigation Plan (Appendix A) and the mitigation measures listed in Section 2.1.7 will reduce exposure to levels of underwater noise above the injury threshold established by NMFS.

For this analysis we estimated take by considering: 1) acoustic thresholds above which the best available science indicates listed marine mammals will be behaviorally harassed or incur some degree of hearing impairment; 2) the area that will be ensonified above these levels in a day; 3) the expected density or occurrence of listed marine mammals within these ensonified areas; and 4) the number of days of activities.

6.2.1.1 Distances to Level A and Level B sound thresholds

Here, we describe operational and environmental parameters of the activity that are used in estimating the area ensonified above the acoustic thresholds, including source levels and the transmission loss coefficient.

The sound field in the project area is the existing background noise plus additional construction noise from the proposed project. Marine mammals are expected to be affected via sound generated by the primary components of the project (*i.e.,* impact pile driving, vibratory pile driving and removal, and DTH).

In order to calculate distances to the Level A harassment and Level B harassment thresholds for the methods and piles being used in this project, NMFS used acoustic monitoring data from other locations to develop source levels for the various pile types, sizes and methods (Table 9). This analysis uses the practical spreading loss model, a standard assumption regarding sound propagation for similar environments, to estimate transmission of sound through water. For this analysis, the transmission loss factor of 15 (4.5 dB per doubling of distance) is used. A weighting adjustment factor of 2.5 or 2, a standard default value for vibratory pile driving and removal or impact driving and DTH respectively, were used to calculate Level A zones.

NMFS recommends treating DTH systems as both impulsive and continuous, non-impulsive sound source types simultaneously. Thus, impulsive thresholds are used to evaluate Level A harassment, and continuous thresholds are used to evaluate Level B harassment. With regards to DTH mono-hammers, NMFS recommends proxy levels for Level A harassment based on

available data regarding DTH systems of similar sized piles and holes (Denes *et al.,* 2019; Guan and Miner, 2020; Reyff and Heyvaert, 2019; Reyff, 2020; Heyvaert and Reyff, 2021) (Table 1 and 2 includes number of piles and duration for each phase; Table 9 includes peak pressure, sound pressure, and sound exposure levels for each pile type).

Table 9. Estimated Underwater Proxy Source Levels for Pile Installation and Removal.

Pile Type	Phase	Proxy Source Levels (dB) at 10 m			Reference
		Peak	RMS	SEL	
Vibratory Pile Driving					
12-24 in timber pile removal	I, II		162		Greenbusch et al. (2018), CALTRANS (2020)
12-24 in steel pile removal	I		161		NAVFAC (2013; 2015)
24 in steel template pile install/removal	I, II				
16 in steel pile	I				
18 in steel pile	I				
24 in steel pile	II				
30 in steel pile	I		161.9		Denes *et al.* (2016)
Steel H-pile	II		165		CALTRANS (2015)
Steel sheet pile	II		162		Buehler *et al.* (2015)
Impact Pile Driving					
16 in steel pile	I	192.8	181.1	168.3	Denes *et al.* (2016)
18 in steel pile	I				
24 in steel pile	II				
30 in steel pile	I	210	190	177	NMFS 2023 analysis*
Steel H-pile	II	200	177	170	CALTRANS (2015)
Steel sheet pile	II	205	190	180	CALTRANS (2015)
DTH Drilling					
16 in steel pile	I		167	159	Heyvaert and Reyff (2021)
18-24 in steel pile	I,II				
30 in steel pile	I		174	164	Denes *et al.* (2019), Reyff and Heyvaert (2019), Reyff (2020)
Steel H-pile	II				

Note: *SEL= sound exposure level; RMS= root mean square.*
**NMFS used the mean of regionally relevant measurements to determine suitable proxy source values for these pile types. Projects included in the analysis were Navy (2012, 2013) and Miner (2020), following the methodology of Navy (2015).*

Level B Harassment Zones

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:

$TL = B * \log_{10} (R_1/R_2)$,

Where:

TL = transmission loss in dB

B = transmission loss coefficient; for practical spreading equals 15

R1 = the distance of the modeled SPL from the driven pile, and

R2 = the distance from the driven pile of the initial measurement.

The recommended TL coefficient for most nearshore environments is the 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 Cordova's proposed underwater activities. The Level B harassment zones and approximate amount of area ensonified for the proposed underwater activities are shown in Table 10.

Level A Harassment Zones

The ensonified area associated with Level A harassment is more technically challenging to predict due to the need to account for a duration component. Therefore, NMFS developed an optional User Spreadsheet tool to accompany the Technical Guidance that can be used to relatively simply predict an isopleth distance for use in conjunction with marine mammal density or occurrence to help predict potential takes. We note that because of some of the assumptions included in the methods underlying this optional tool, we anticipate that the resulting isopleth estimates are typically going to be overestimates of some degree, which may result in an overestimate of potential take by Level A harassment. However, this optional tool offers the best way to estimate isopleth distances when more sophisticated modeling methods are not available or practical. For stationary sources, such as pile installation or removal, the optional User Spreadsheet tool predicts the distance at which, if a marine mammal remained at that distance for the duration of the activity, it would be expected to incur PTS. The isopleths generated by the User Spreadsheet used the same TL coefficient as the Level B harassment zone calculations (*i.e.,* the practical spreading value of 15). Inputs used in the User Spreadsheet (*e.g.,* number of piles per day, duration and/or strikes per pile) are presented in Tables 1 and 2. The maximum RMS SPL, SEL, and resulting isopleths are reported in Tables 9 and 10.

Table 10. Level A and Level B Harassment Isopleths for Pile Driving Activities.

Pile Type	Phase	Distances to Level A and Level B thresholds (m)		Ensonified Area[1,2] for Level B (km^2)
		Level A	Level B	
12-24 in timber pile removal	I, II	0.9	6,309.6	125
12-24 in steel pile removal	I	0.8	5,411.7	92
24 in steel template pile install/removal	I, II	0.4		
16 in steel pile	I	0.5		
18 in steel pile	I	0.7		
24 in steel pile	II			
30 in steel pile	I	0.7	6,213.5	121.2
steel H-pile	II	0.5	10,000	314
steel sheet pile	II	0.3	6,310	125
Impact Pile Driving				
16 in steel pile	I	5.2	255	0.2
18 in steel pile	I			
24 in steel pile	II			
30 in steel pile	I	25.9	1,000	3.14
steel H-pile	II	13.3	341.5	0.37
steel sheet pile	II	61.5	1,000	3.14
DTH Drilling				
16 in steel pile	I	35.2	13,593.6	580.2
18-24 in steel pile	I,II			
30 in steel pile	I	67.1	39,810.7	4976.6
steel H-pile	II			

6.2.2 Marine Mammal Occurrence and Exposure Estimates

Information about marine mammal presence, density, local knowledge, group dynamics, or other relevant information informs the take calculations in Section 10. Daily occurrence probability of Steller sea lions in the action area is based on consultation with local researchers and marine professionals. Occurrence probability estimates are based on conservative density approximations and factor in historic data of occurrence, seasonality, and group size in Orca Bay, Orca Inlet, and/or Prince William Sound. To accurately describe species occurrence near the action area, marine mammals were described as either common (multiple sightings every month, could occur each day), frequent (multiple sightings every year, could occur each month), or infrequent (few sightings every year, could occur each month). Steller sea lions, both within and outside the harbor, were considered to be common year-round. Estimated occurrence of sea lions in the action area is 1 group per day within the harbor, and 2 groups per day outside the harbor. Group size is estimated to be 4.1 animals[11].

For total underwater take estimate, the daily occurrence probability for a species was multiplied by the estimated group size and by the number of days of each type of pile driving activity. Group size is based on the best available published research for these species and their presence in this area.

Estimated take = Group size x Groups per day x Days of pile driving activity

For Phase I Level A take, 4.1 per group x 1 group per day x 26.1 days = 107

For Phase I Level B take, 4.1 per group x 2 groups per day x 96.1 days = 788

For Phase II Level A take, 4.1 per group x 1 group per day x 23.9 days = 98

For Phase II Level B take, 4.1 per group x 2 groups per day x 89.0 days = 730

Total number of takes = 1,723

6.2.3 Sunflower Sea Star Occurrence and Exposure Estimates

Prior to the Sea Star Wasting Syndrome (SSWS) pandemic, abundance varied geographically in Alaska: They were reported as quite common in western Prince William Sound (average 0.233/m2) (Konar et al.2019). Post-pandemic densities are much lower, and range from 0 to 0.04/m 2 at the sites that once had the highest density (western Prince William Sound)(Traiger et al. 2022).

Assuming a density of 0.04 sea stars/m^2 and applying this figure to the dredge and fill areas

[11] Group size was averaged from seasonal data. Solstice (2023). Endangered Species Act Section 7 Biological Assessment for Listed Species under the Jurisdiction of the National Marine Fisheries Service
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described in Table 3, we arrive at an estimate of 240 sunflower sea stars exposed, with perhaps a fractional increase due to pile driving activities.

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.

The response of a marine mammal to an anthropogenic sound depends on the frequency, duration, temporal pattern, and amplitude of the sound as well as the animal's prior experience with the sound and the context in which the sound is encountered (i.e., what the animal is doing at the time of the exposure). The distance from the sound source and if it is perceived as approaching or moving away can affect the way an animal responds to a sound (Wartzok, Popper et al. 2003).

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

Loud underwater noise can result in physical effects on the marine environment that can affect marine organisms. Possible responses by 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, vocalizations, or feeding behavior

6.3.1 Permanent and temporary hearing impairment

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 2018). The amount of threshold shift is customarily expressed in decibels (dB). A TS can be permanent or temporary. As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal 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 (seconds to minutes or hours to days), 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 an animal uses sound within the frequency band of the signal; *e.g.,* Kastelein *et al.,* 2014), and the overlap between the animal and the source (*e.g.,* spatial, temporal, and spectral).

6.3.1.1 Permanent Threshold Shift (PTS)

NMFS defines PTS as a permanent, irreversible 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 2018). Available data from humans and other terrestrial mammals indicate that a 40 dB threshold shift approximates PTS onset (see Ward *et al.,* 1958, 1959; Ward 1960; Kryter *et al.,* 1966; Miller 1974; Ahroon *et al.,* 1996; Henderson *et al.,* 2008). PTS levels for marine mammals are estimates, as with the exception of a single study unintentionally inducing PTS in a harbor seal (Kastak *et al.,* 2008), there are no empirical data measuring PTS in marine mammals largely due to the fact that, for various ethical reasons, experiments involving anthropogenic noise exposure at levels inducing PTS are not typically pursued or authorized (NMFS 2018).

6.3.1.2 Temporary Threshold Shift (TTS)

TTS is a temporary, reversible 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 2018). Based on data from cetacean TTS measurements (see Southall *et al.,* 2007), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al.,* 2000; Finneran *et al.,* 2000, 2002). As described in Finneran (2015), marine mammal studies have shown the amount of TTS increases with cumulative sound exposure level (SELcum) in an accelerating fashion: At low exposures with lower SELcum, the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher SELcum, the growth curves become steeper and approach linear relationships with the noise SEL.

Depending on the degree (elevation of threshold in dB), duration (*i.e.,* recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that takes place during a time when the animal is traveling through the open ocean, where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of

TTS sustained during a time when communication is critical for successful mother/calf interactions could have more serious impacts. We note that reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.,* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Many studies have examined noise-induced hearing loss in marine mammals (see Finneran (2015) and Southall *et al.* (2019) for summaries). For pinnipeds in water, measurements of TTS are limited to harbor seals, elephant seals (*Mirounga angustirostris*), and California sea lions (*Zalophus californianus*). These studies examine hearing thresholds measured in marine mammals before and after exposure to intense sounds. The difference between the pre-exposure and post-exposure thresholds can be used to determine the amount of threshold shift at various post-exposure times. The amount and onset of TTS depends on the exposure frequency. Sounds at low frequencies, well below the region of best sensitivity, are less hazardous than those at higher frequencies, near the region of best sensitivity (Finneran and Schlundt, 2013). At low frequencies, onset-TTS exposure levels are higher compared to those in the region of best sensitivity (*i.e.,* a low frequency noise would need to be louder to cause TTS onset when TTS exposure level is higher), as shown for harbor porpoises and harbor seals (Kastelein *et al.,* 2019a, 2019b). In addition, TTS can accumulate across multiple exposures, but the resulting TTS will be less than the TTS from a single, continuous exposure with the same SEL (Finneran *et al.,* 2010; Kastelein *et al.,* 2014; Kastelein *et al.,* 2015a; Mooney *et al.,* 2009). This means that TTS predictions based on the total, cumulative SEL will overestimate the amount of TTS from intermittent exposures such as sonars and impulsive sources. Nachtigall *et al.,* (2018) describe the measurements of hearing sensitivity of multiple odontocete species (bottlenose dolphin, harbor porpoise, beluga, and false killer whale (*Pseudorca crassidens*)) when a relatively loud sound was preceded by a warning sound. These captive animals were shown to reduce hearing sensitivity when warned of an impending intense sound. Based on these experimental observations of captive animals, the authors suggest that wild animals may dampen their hearing during prolonged exposures or if conditioned to anticipate intense sounds.

6.3.2 Non-auditory physiological response

Stress is the primary non-auditory physiological effects that could occur in marine mammals exposed to underwater sound from the project. Marine, like terrestrial, mammals may exhibit a generalized stress response (elevated levels of "stress hormones" such as cortisol and corticosterone) to anthropogenic noise in their environment (Rosen and Kumagai 2008). Prolonged exposure to stress may result in immune system suppression, reproductive failure, accelerated aging, and slowed growth.

Although most research on physiological stress response has focused on terrestrial species (Wright et al. 2007, Atkinson et al. 2015), stress responses of marine mammals have been reviewed (ONR 2009) and studied (Fair et al. 2017; Romano et al. 2005). Clark et al. (2005) documented adrenal exhaustion in chronically stressed marine mammals. Rolland et al. (2012) found that noise reduction from lower exposure to ship traffic in the Bay of Fundy was

associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals, including pinnipeds, could experience physiological stress responses upon exposure to intense and repeated sounds.

For non-impulsive sounds, data suggest that exposures of pinnipeds to sources between 90 and 140 dB re 1 µPa do not elicit strong behavioral responses (Kvadsheim et al. 2010). Although hood seals (*Cystophora cristata*) initially responded to sounds by reducing diving activity, increasing rapid exploratory swimming at surface, and lifting their heads out of the water, upon repeated exposure, regardless of signal frequency, the seals adapted to the exposure. The initial exploratory surface swimming ceased and they directly transitioned from diving to passive floating with their heads out of the water in an area furthest from the sound source. The seals had the option of hauling out on a platform, but none did. Their heart rate increased at the surface indicating emotional activation during sound exposure, but lack of effect of exposure on heart rate during diving indicates that physiological responses during diving remained normal (Kvadsheim et al. 2010).

Experimentally, Götz and Janik (2011) tested underwater responses in wild-captured gray seals to a startling sound (sound with a rapid rise time and a 93 dB sensation level) and a non-startling sound (sound with the same level, but with a slower rise time). The animals exposed to the startling treatment avoided a known food source, whereas animals exposed to the non-startling treatment either did not react or habituated during the exposure period. The results of this study highlight the importance of the characteristics of the acoustic signal in an animal's habituation. In cases where marine mammal response is brief (i.e., changing from one behavior to another, relocating a short distance, or ceasing vocalization), the effect(s) are not likely to be measurable at the population level, but could rise to the level of take of individuals.

Individual pinnipeds could react to the continuous sounds created by the vibratory pile driving at Cordova harbor by alerting or temporarily avoiding the area close to the source; however, feeding or reproduction is unlikely to be compromised because the behavioral response is expected to be very short in duration. The expected response of swimming away from the sound source or raising the head above the water surface is not likely to increase energy expenditure to the point of significantly disrupting normal behavioral patterns. Based on the reactions of hooded seals (Kvadsheim et al. 2010) and gray seals (Götz and Janik 2010) we expect that seals that stay within the Level B zone will become accustomed to the sound and will have very little reaction after the initial start up of pile driving. In cases where marine mammal response is brief (i.e., changing from one behavior to another, relocating a short distance, or ceasing vocalization), the effect(s) are not likely to be measurable at the population level, but could rise to the level of take of individuals. The production of noise producing activities, related to the Cordova Harbor Rebuild project will occur throughout the construction window described in Section 2. However, the loudest noise (from pile driving) will be episodic. Sheet pile pairs in Kotzebue took fewer than 5 minutes to install. More time is spent moving equipment and positioning the piles than actually driving them. Noise from dredging, rock placement, vessels, and pile driving is expected to increase the ambient and background sound level and intermittently add large amounts of sound to the underwater habitat. These noise levels could cause stress to individuals

that are sensitive to sound and they may avoid the harbor and other ensonified areas, especially when pile driving is occurring.

6.3.3 Behavioral Responses

Exposure to noise from pile driving and removal also has the potential to behaviorally disturb marine mammals. Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.,* Lusseau and Bejder 2007; Weilgart 2007).

6.3.3.1 Masking

Auditory interference, or masking, occurs when a noise is similar in frequency and intensity to (or more intense than) the auditory signal received by an animal while it is echolocating or listening for acoustic information from other animals. Masking can interfere with an animal's ability to gather acoustic information about its environment, including information regarding predators, prey, conspecifics, and other environmental cues (Francis and Barber 2013). Steller sea lions are more likely to communicate with barks and trills and use their other senses and their highly developed vibrissae to hunt for prey when water is turbid or murky.

The Cordova Harbor project will occur in a relatively busy harbor, where vessel sounds and dock activity already occur. Pile driving will increase the noise levels, but as explained in section 6.2.1, the pattern of pile driving will be episodic; there will be significant amounts of time when pile driving is not occurring.

6.3.3.2 Sound Tolerance

In general, pinnipeds seem more tolerant of underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok, Popper 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, Greene Jr et al. 1995, NRC 2003, Wartzok, Popper et al. 2003).

6.3.3.3 Change in dive, respiration, vocalizations, or feeding behavior

Disturbance may result in changing durations of surfacing and dives or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior; or avoidance of areas where sound sources are located. Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.,* species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.,* Richardson *et al.,* 1995; Wartzok *et al.,* 2003; Southall *et al.,* 2007; Weilgart 2007). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.,* 2012), and can vary depending on characteristics associated with the sound source (*e.g.,* whether it is moving or stationary, number of sources, distance from the source).

Differential responses are expected among and within species based on age, prior experience, activity at time of exposure (e.g. feeding vs resting), individual characteristics (e.g. more or less sensitive), and hearing acuity. Therefore, individuals of the same species may react differently to the same, or similar, stressors.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators, or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.,* Croll *et al.,* 2001; Nowacek *et al.,* 2004; Madsen *et al.,* 2006; Yazvenko *et al.,* 2007). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

For non-impulsive sounds, data suggest that exposures of pinnipeds to sources between 90 and 140 dB re 1 μPa do not elicit strong behavioral responses (Kvadsheim et al. 2010). Although hooded seals (*Cystophora cristata*) initially responded to sounds by reducing diving activity, increasing rapid exploratory swimming at surface, and lifting their heads out of the water, upon repeated exposure, regardless of signal frequency, the seals adapted to the exposure. The initial exploratory surface swimming ceased and they transitioned from diving to passive floating with their heads out of the water in an area furthest from the sound source. The seals had the option of hauling out on a platform, but none did. Their heart rate increased at the surface, indicating emotional activation during sound exposure, but lack of effect of exposure on heart rate during diving indicates that physiological responses during diving remained normal (Kvadsheim et al. 2010).

6.4 Anticipated Effects on Habitat

Cordova's construction activities could have localized, temporary impacts on marine mammal habitat and their prey by increasing in-water sound pressure levels and slightly decreasing water quality. However, its proposed location is within the current harbor footprint and is located in an area that is currently used by numerous commercial fishing and personal vessels. Construction activities are of short duration and will likely have temporary impacts on marine mammal habitat through increases in underwater and airborne sound. Increased noise levels may affect acoustic habitat (see masking discussion above) and adversely affect marine mammal prey in the vicinity of the project area (see discussion below). During DTH drilling, impact, and vibratory pile driving, elevated levels of underwater noise will ensonify the project area where both fish and mammals occur and could affect foraging success. Additionally, marine mammals may avoid the area during construction; however, displacement due to noise is expected to be temporary and is not expected to result in long-term effects to the individuals or populations.

Temporary and localized increase in turbidity near the seafloor will occur in the immediate area surrounding the area where piles are installed or removed. In general, turbidity associated with pile installation is localized to about a 25-ft (7.6 m) radius around the pile (Everitt *et al.,* 1980). The sediments of the project site will settle out rapidly when disturbed. Pinnipeds are expected to avoid localized areas of turbidity.

The proposed activities will not result in permanent impacts to habitats used directly by marine mammals as the project will not expand mooring capacity in Cordova Harbor, and no increases in vessel traffic in the area are expected as a result of this project. The total seafloor area likely impacted by the project is relatively small compared to the available habitat in Southcentral Alaska. Orca Inlet is included in the designated critical habitat for western Steller sea lions and these sea lions could experience a temporary loss of suitable habitat in the action area for 1 to 5 hours per day over 170 days during Phase I and 1 to 8.5 hours per day over 88 days during Phase II of construction if elevated noise levels associated with in-water construction results in their displacement from the area. However, the project will only impact the essential physical and biological features that make the area critical habitat for western Steller sea lions, such as good water quality, prey availability, or open space for transiting and foraging when the ensonified area extends beyond Cordova Harbor. The area already has elevated noise levels because of busy vessel traffic transiting through the area, and critical habitat impacts will not be permanent nor will it result long-term effects to the local population. No known rookeries or major haulouts will be impacted. Additionally, the total seafloor area affected by pile installation and removal is a small area compared to the vast foraging area available to marine mammals in the area. At best, the impact area provides marginal foraging habitat for marine mammals and fishes. Furthermore, pile driving at the project site will not obstruct movements or migration of marine mammals.

The proposed activities at the project area will not result in permanent negative impacts to habitats used directly by marine mammals and sea stars, but may have potential short-term impacts to food sources, such as forage fish and marine invertebrates, and may affect acoustic habitat. Steller sea lions and sunflower sea stars likely occur in the action area year round

depending on food availability. While Steller sea lions and sunflower sea stars feed in Orca Inlet and the action area, this is a small portion of their overall feeding area. The small portion of the area affected by the construction and construction noise, in conjunction with the short temporal scale of construction activity, make it unlikely the effects of the construction will significantly alter the foraging habitat of Steller sea lions or sunflower sea stars in the Gulf of Alaska. Therefore, the main impact issues associated with the proposed action will be temporarily elevated sound levels and the associated direct effects on marine mammals, and the brief removal of sunflower sea stars from the marine environment, as discussed previously in this document. The primary potential acoustic impacts to marine mammal habitat are associated with elevated sound levels produced by pile installation and removal.

Short-term turbidity increases will likely occur during in-water construction work, including pile driving and removal. The physical resuspension of sediments could produce localized turbidity plumes that could last from a few minutes to several hours. In general, turbidity associated with pile installation and removal is expected to be localized to about a 25 ft radius around the pile. Because of the relatively small work area, any increase in turbidity will be limited to the immediate vicinity of the project site. There is little potential for pinnipeds to be exposed to increased turbidity during construction operations. A small number of sunflower sea stars may be exposed to turbidity for a short amount of time.

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

6.5 Effects on Potential Prey

Avoidance by potential prey (*i.e.,* fish) of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. Any behavioral avoidance by fish of the disturbed area will still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity.

Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species. Fish utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.,* Zelick and Mann, 1999; Fay, 2009). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.,* 2008). The potential effects of noise on fishes depends on the overlapping frequency range, distance from the sound source, water depth of exposure, and species-specific hearing sensitivity, anatomy, and physiology. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality.

Fish react to sounds which are especially strong and/or intermittent low-frequency sounds, and behavioral responses such as flight or avoidance are the most likely effects. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to noise depends on the physiological state of the fish, past exposures, motivation (*e.g.,* feeding, spawning, migration), and other environmental factors. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.,* Scholik and Yan, 2001, 2002; Popper and Hastings, 2009). Several studies have demonstrated that impulse sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g.,* Fewtrell and McCauley, 2012; Pearson *et al.,* 1992; Skalski *et al.,* 1992; Santulli *et al.,* 1999; Paxton *et al.,* 2017). However, some studies have shown no or slight reaction to impulse sounds (*e.g.,* Wardle *et al.,* 2001; Jorgenson and Gyselman, 2009).

SPLs of sufficient strength have been known to cause injury to fish and fish mortality. However, in most fish species, hair cells in the ear continuously regenerate and loss of auditory function likely is restored when damaged cells are replaced with new cells. Halvorsen *et al.,* (2012a) showed that a TTS of 4-6 dB was recoverable within 24 hours for one species. Impacts will be most severe when the individual fish is close to the source and when the duration of exposure is long. Injury caused by barotrauma can range from slight to severe and can cause death, and is most likely for fish with swim bladders. Barotrauma injuries have been documented during controlled exposure to impact pile driving (Halvorsen *et al.,* 2012b; Casper *et al.,* 2013).

The most likely impact to fish from pile driving activities at the project areas will be temporary behavioral avoidance of the area. The duration of fish avoidance of an area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is expected.

Construction activities, in the form of increased turbidity, have the potential to adversely affect forage fish in the project area. Forage fish form a significant prey base for many marine mammal species that occur in the project area. Increased turbidity is expected to occur in the immediate vicinity (on the order of 10 ft (3 m) or less) of construction activities. However, suspended sediments and particulates are expected to dissipate quickly within a single tidal cycle. Given the limited area affected and high tidal dilution rates, any effects on forage fish are expected to be minor or negligible.

In summary, given the short daily duration of sound associated with individual pile driving events and the relatively small areas being affected, pile driving activities associated with the proposed action are not likely to have a permanent adverse effect on any fish habitat, or populations of fish species. Any behavioral avoidance by fish of the disturbed area will still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. Thus, we conclude that impacts of the specified activity are not likely to have more than short-term adverse effects on any prey habitat or populations of prey species. Further, any impacts to marine mammal habitat are expected to result in insignificant impacts upon individual marine mammals, and will not contribute to adverse impacts on their populations.

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.

We searched for information on non-Federal actions reasonably certain to occur in the action area. We did not find any information about non-Federal actions other than what has already been described in the Environmental Baseline (Section 5 of this Opinion). Some continuing non-Federal activities are reasonably certain to contribute to climate change within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the Environmental Baseline (Section 5).

Reasonably foreseeable future state, local, or private actions are hard to predict, but the main actions include activities that relate to vessel traffic and commercial fishing.

The Cordova Harbor is a transportation and service hub for the surrounding Prince William Sound, offering year-round vessel access to dedicated fishing grounds and safe harbor to mariners.

The harbor is the center of the Cordova's economy. With a capacity of 711 vessels, the harbor is one of Alaska's largest single basin harbors and houses one of the largest commercial fishing fleets in the country. Fishing vessels and seafood processors working out of the harbor led to Cordova ranking sixteenth in the US in 2018 for fishery landings with 59 million pounds delivered and eighteenth in the nation for value, with those landings worth $55 million. Out of approximately 2,600 year-round residents in Cordova, roughly 400 people hold commercial fishing licenses and work out of the harbor (Solstice 2023). About 950 employees work at five seafood processing facilities that are supplied fish from vessels that use the harbor, and the city estimates that over 1,000 Cordova jobs (not counting fishermen) are related to the fisheries.

Vessel traffic is expected to continue in Orca Inlet. It is unknown whether overall vessel traffic or shipping will increase in the future, as this depends largely on 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.

Fishing, a major industry in Alaska, is expected to continue in PWS and the Gulf of Alaska. As a result, there will be continued risk to marine mammals of prey competition, ship strikes, harassment, and entanglement in fishing gear. NMFS assumes that ADFG will continue to manage fish stocks and monitor and regulate fishing under their jurisdiction to maintain sustainable stocks. It remains unknown whether, and to what extent, marine mammal prey may

be less available due to commercial, subsistence, personal use, and sport fishing. In addition, we do not know the full extent of the effects of fishing vessel traffic on availability of prey to listed species.

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 Western DPS Steller Sea Lion Risk Analysis

With warmer temperatures, toxins from harmful algal blooms have increased (section 5). The marine heatwave that occurred from 2013-2015, caused an unprecedented harmful algal bloom (HAB) that extended from the Aleutian Islands to southern California resulting in mass strandings of marine mammals including Steller sea lions. Testing for biotoxins in marine mammals show that HAB toxins are present throughout Alaska waters at levels high enough to be detected in Steller sea lions and have the potential to impact marine mammal health. Exposure to new diseases or greater vulnerability to disease as a consequence of stress may occur as a consequence of climate change (section 5). As explained in section 4, ocean acidification may lead to water that is highly corrosive to calcifying organisms such as zooplankton, consequently affecting food webs and the prey that Steller sea lions depend on. Although these consequences of climate change are foreseeable, climate-driven effects on Steller sea lions remain unquantifiable and immeasurable at this time.

Commercial fishing likely affects prey availability throughout much of the Western DPS's range, and causes a small number of direct mortalities each year. Predation has been considered a potentially high level threat to this DPS, and may remain so. Subsistence hunting occurs at fairly low levels for this DPS. Illegal shooting is also a continuing threat, but the number of illegally shot sea lions found in the region to date have not precluded or measurably delayed recovery of the species.

Exposure to non-biodegradable marine debris, specifically to debris that can cause entanglement, remains an unquantifiable risk, but associated effects from this project will be immeasurably small. 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 will be temporary and localized, and have an immeasurably small effect, if any, upon Steller sea lions. 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.

Exposure to vessel noise and presence, marine debris, seafloor disturbance and turbidity, and small oil spills may occur, but such exposure will have a very small impact, and we conclude that these stressors will not result in take of Steller sea lions. The temporary 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).

It is difficult to estimate the behavioral changes, if any, that Western DPS Steller sea lions in the action area may exhibit in response 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 Orca 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 2008). The Steller sea lion rookery nearest to this project is on Seal Rocks, located in the Hinchinbrook Entrance between Hinchinbrook and Montague Islands, 73 km southwest of the project site (Figure 8). 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 1,723 Western DPS Steller sea lions may be exposed to noise from pile driving. These estimates represent the expected 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 decreases 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.

8.2 Sunflower Sea Star Risk Analysis

Our consideration of probable exposures and responses of proposed threatened sunflower sea stars to construction activities associated with the proposed action is designed to help us assess whether those activities are likely to increase the extinction risk or jeopardize the continued existence of the species.

Effects from exposure to in-air noise, in-water noise, and vessel use are likely negligible due to the lack of expected responses from sea stars to these potential stressors. Effects from disturbance to the benthic environment and pilings where sunflower sea stars may be located are expected to occur at a minor level.

The primary threat to sunflower sea stars identified in the draft Status Review Report (Lowry 2022) and proposed rule to list the sunflower sea star as threatened (88 FR 16212; March 16, 2023), is sea star wasting syndrome (SSWS). Based on our analysis of the action, no aspect of the proposed action is expected to increase the prevalence of SSWS in sunflower sea stars.

The geographic scope of this project is small relative to the entire range of the species. Habitat and prey impacts for the sunflower sea star are extremely small. The effects from the proposed action on sunflower sea stars are not likely to reduce the reproduction rates or growth rates of sunflower sea stars. Due to the limited geographic and temporal scope of the project, we do not expect significant increases in vulnerability to a SSWS pandemic as a result of the proposed action. The number of individuals that will be affected is very small relative to the estimated

population of sunflower sea stars (over 600 million) ((Lowry 2022). Based on some evidence of recent recruitment and localized abundance increases, the current coastal construction regime in Alaska does not appear to be limiting sunflower sea star recovery.

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 Western DPS Steller sea lions or the proposed sunflower sea star. NMFS also concludes that the proposed action is not likely to adversely affect Western North Pacific DPS humpback whales, Mexico DPS humpback whales, fin whales or to destroy or adversely modify designated Steller sea lion critical habitat

10 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species unless there is a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (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)). For this consultation, MARAD and PR1 anticipate that take will be by Level A and Level B harassment.

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

Section 7(b)(4)(C) of the ESA provides that if an endangered or threatened marine mammal is involved, the taking must first be authorized by section 101(a)(5) of the MMPA. Accordingly, **the terms of this incidental take statement and the exemption from section 9 of the ESA become effective only upon the issuance of MMPA authorization to take the marine**

mammals identified here. Absent such authorization, this incidental take statement is inoperative.

The terms and conditions described below must be implemented in order for take authorization of this Incidental Take Statement to be valid, and are nondiscretionary. MARAD and PR1 have a continuing duty to regulate the activities covered by this ITS. In order to monitor the impact of incidental take, MARAD and PR1 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 MARAD or PR1 (1) fails 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) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

10.1 Amount or Extent of Take

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

The taking of 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 A and Level B harassment is described in Section 6.2.2.

Table 11. Summary of instances of exposure associated with the proposed pile driving/removal resulting in incidental take of ESA-listed species by Level A and Level B harassment.

Species	Proposed Authorized Level A Takes	Proposed Authorized Level B Takes	Anticipated Temporal Extent of Take
Western DPS Steller sea lion (*Eumetopias jubatus*)	205	1,518	September 1, 2023 through August 31, 2025

10.1.1 Amount of Take associated with Sunflower Sea Stars

Based on the estimated density of sunflower sea stars in the action area and the surface area of the dredge and fill operations that will come in contact with the sea floor, we estimate that up to 240 sunflower sea stars may be harmed or killed (Section 6.2.3).

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.

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

240 sunflower sea star mortalities are anticipated as a result of the proposed action. The current range-wide (*i.e.,* global) population estimate for the sunflower sea star is nearly 600 million individuals, based on a compilation of the best available science and information (Gravem *et al.* 2021). This is 0.00004% of the population. Take prohibitions have not been proposed for this species at this point.

10.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" 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 Western DPS Steller sea lions resulting from the proposed action.

1. MARAD and PR1 must implement a monitoring program that includes all items described in the mitigation measures section of this opinion (Section 2.1.2) and allows NMFS AKR to evaluate the exposure estimates contained in this opinion and that underlie this ITS.
2. MARAD and PR1 must submit a final report to NMFS AKR that evaluates 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. MARAD, PR1 or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR § 402.14(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, MARAD and PR1 must undertake (or require their lessees or permittees to undertake) the following:

1. The monitoring zones must be fully observed by qualified PSOs during all in-water work in order to document observed incidents of harassment as described in the mitigation measures associated with this action.
2. If take of Western DPS Steller sea lions totals 80% of takes authorized in the ITS, MARAD will notify NMFS by email, attn: david.gann@noaa.gov and discuss the need for reinitiation of consultation.

To carry out RPM #2, MARAD and PR1 must undertake (or require their lessees or permittees to 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.
2. Adhere to all monitoring and reporting requirements in the MMMMP or revisions described in this biological opinion.
3. Submit a project specific report within 90 days of the conclusion of the project that analyzes and summarizes interactions with Steller sea lions during this project to the Protected Resources Division, NMFS by email to AKR.section7@noaa.gov. This report must also contain information described in the mitigation measures located in Section 2.1.7 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, MARAD should notify NMFS of any conservation recommendations they implement in their final report.

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 MARAD, PR1, and the general public. These consultations help to fulfill multiple legal obligations of the named agencies. The information is also useful and of interest to the general public as it describes the manner in which public trust resources are being managed and conserved. The information presented in these documents and used in the underlying consultations represents the best available scientific and commercial information and has been improved through interaction with the consulting agency.

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

13.2 Integrity

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

13.3 Objectivity

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

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

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

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

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15 APPENDIX A

MARINE MAMMAL MONITORING AND MITIGATION PLAN

Marine Mammal Monitoring and Mitigation Plan

City of Cordova

Cordova Harbor Rebuild Project

Orca Inlet, Cordova, Alaska

April 2023

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Submitted to:
National Marine Fisheries Service

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ACRONYMS AND ABBREVIATIONS

3M	Marine Mammal Management
4MP	Marine Mammal Monitoring and Mitigation Plan
DPS	distinct population segment
DTH	down the hole
ESA	Endangered Species Act
HTL	high tide line
IHA	Incidental Harassment Authorization
LF	low-frequency
MF	high-frequency
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
OW	otariid
Permits Division	Office of Protected Resources Permits and Conservation Division
PSO	protected species observer
PW	phocid
rms	root mean square
SPL	sound pressure level
USACE	U.S. Army Corp of Engineers
USFWS	U.S. Fish and Wildlife Service
WDPS	Western Distinct Population Segment

1 INTRODUCTION

The City of Cordova proposes the following Marine Mammal Monitoring and Mitigation Plan (4MP) for use during pile installation/removal and dredging during construction for the Cordova Harbor Rebuild Project in Cordova, Alaska (Figure 1). The project is in waters of the U.S., within the ranges of marine mammals listed in the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA), and has the potential to generate noise that could exceed Level A and B harassment thresholds established by the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). This 4MP supports the Biological Assessment, in accordance with the ESA, and the Incidental Harassment Authorization (IHA) applications, in accordance with the MMPA (Section 101(a)(5)(D) permitting).[1] Monitoring and shutdown zones will be implemented to minimize Level A and Level B harassment of marine mammals.

The goal of this 4MP is to ensure compliance with the ESA and the MMPA when implemented by the protected species observers (PSOs) at the project site. The project will comply with the terms and conditions outlined in the following requested permits and authorizations:

- U.S. Army Corp of Engineers (USACE), Orca Inlet for activities in Waters of the U.S. (forthcoming)
- NMFS Alaska Region, ESA Section 7(a)(2) Biological Opinion (requested)
- NMFS Office of Protected Resources Permits and Conservation Division (Permits Division) IHA (requested)
- USFWS Alaska Region Marine Mammal Management (3M) IHA (requested)

[1] This draft 4MP reflects the draft Biological Assessment submitted to NMFS and will be revised as needed for submission with the NMFS IHA application and USFWS IHA application.

Figure 1. Location of Proposed Cordova Harbor Rebuild Project

2 PROJECT DESCRIPTION

The City of Cordova is proposing to upgrade and restore their harbor. The Cordova Harbor is a transportation and service hub for the region surrounding the City of Cordova, offering year-round vessel access to dedicated fishing grounds and safe harbor to mariners. The harbor is past its useful life and is no longer able to adequately support the vessels using the harbor. The project would involve removing components associated with the existing dock structure in the South Harbor and installing new floats, supports, gangways, a boat grid, floating service dock, and an access ramp. The new South Harbor components would include electrical, water, sewage, fire line, and wireless connections. Sheet pile bulkhead would be installed along the north and eastern edges of the harbor to create an expanded uplands area. Commercial lease areas and green space would be designated at the North Harbor uplands. The project would also replace the creosote treated piles at the existing three-stage dock with steel piles. The project action area extends 4.5 kilometers from the South Harbor and 15.9 kilometers from the North Harbor. Construction would begin in August 2023 and be completed in June 2024. During Phase I, pile removal and installation activities is expected to occur for a total of approximately 433 hours over 170 days (not necessarily consecutive days). During Phase II, pile removal and installation activities are expected to occur for a total of approximately 148 hours over 88 days and dredging work is expected to occur for a total of approximately 660 hours over 77 days (not necessarily consecutive days). The project would occur within waters of the United States. No

blasting is proposed as part of this project. Table 1, Table 2, and Table 3 provide a more detailed overview of the project components.

Table 1. Cordova Harbor Rebuild Project Groundwork Summary – Phase I and II

Construction Activity	Description					
	Soil Type	Phase (Harbor)	Area (acres)	Total Quantity (cubic yards)	Total Time (hours)	# of Days
Excavating (Above HTL)	Alluvial, Gravel, and Riprap	I (South)	1.0	10,000	300	35
Dredging	Alluvial, Gravel, and Riprap	II (North)	1.5	22,000	660	77
Filling	Alluvial, Gravel, and Riprap	I (South) (Above HTL)	1.0	15,000	300	35
		II (North and Boat Launch)	1.5	47,970	946	110

Table 2. Cordova Harbor Rebuild Project Pile Size, Quantity, and Installation Method -Phase I

	In-Water (Below High Tide Line)							In-Air (Above High Tide Line)			
	Perm Pile Removal	Perm Pile Removal	Temp Pile Installation	Temp Pile Removal	Perm Pile Installation	Perm Pile Installation	Perm Pile Installation	Temp Pile Installation	Temp Pile Removal	Perm Pile Installation	Perm Pile Installation
Diameter of Piles (inches)	12	12	24	24	16	18	30	24	24	18	14x89
Pile Type	Timber	Steel	Steel Pipe	Steel Pipe	Steel Pipe	Steel Pipe	Steel Pipe	Steel Pipe	Steel Pipe	Steel Pipe	Steel H
Total # of Piles	130	61	61	61	155	70	30	70	70	70	140
Vibratory Pile Driving											
Total Quantity	130	61	61	61	155	70	30	70	70	70	140
Max # Piles Vibrated Per Day	25	25	6	10	10	10	6	6	10	6	10
Vibratory Time Per Pile (minutes)	10	10	10	10	15	20	30	10	10	10	15
Vibratory Time Per Day (hours)	4.2	4.2	1.0	1.7	2.5	3.3	3.0	1.0	1.7	1.0	2.5
Number of Days	5.2	2.4	10.2	6.1	15.5	7.0	5.0	11.7	7.0	11.7	14.0
Vibratory Time Total (hours)	21.7	10.2	10.2	10.2	38.8	23.3	15.0	11.7	11.7	11.7	35
Impact Pile Driving											
Total Quantity	--	--	--	--	73	35	20	--	--	35	70
Max # Piles Impacted Per Day	--	--	--	--	6	6	6	--	--	4	6
# of Strikes Per Pile	--	--	--	--	240	240	360	--	--	180	150
Impact Time Per Pile (minutes)	--	--	--	--	20	20	20	--	--	20	20
Impact Time Per Day (hours)	--	--	--	--	2.0	2.0	2.0	--	--	1.3	2.0
Number of Days	--	--	--	--	12.2	5.8	3.3	--	--	8.8	11.7
Impact Time Total (hours)	--	--	--	--	24.3	11.7	7	--	--	12	23
Down-The-Hole Pile (DTH) Drilling											
Total Quantity	--	--	--	--	50	20	16	--	--	18	35
Max # of Piles Installed per Day	--	--	--	--	4	4	4	--	--	4	5
# of Strikes Per Pile	--	--	--	--	54000	54000	54000	--	--	2700	40500
# of Strikes Per Second	--	--	--	--	10	10	10	--	--	10	10
Total Drilling Time Per Pile (minutes)	--	--	--	--	90	90	90	--	--	60	80
Actual Drilling Time Per Pile (minutes)	--	--	--	--	75	75	75	--	--	45	60
Time per Day (hours)	--	--	--	--	5	5	5	--	--	3	5
Number of Days	--	--	--	--	12.5	5.0	4.0	--	--	4.5	7.0
DTH Drilling Time Total (hours)	--	--	--	--	62.5	25	20	--	--	13.5	35

[1] For Phase I, in-water pile installation and removal activities includes the following project components in the South Harbor: South Harbor demolition; G, H, I, J, K, N, and N' main walk floats; access trestle, fixed dock, and drive down dock and transfer bridge.

[2] In-air pile installation and removal activities includes the South Harbor bulkhead.

Table 3. Cordova Harbor Rebuild Project Pile Size, Quantity, and Installation Method -Phase II

	Permanent Pile Removal	Temporary Pile Installation		Perm Pile Installation		
Diameter of Piles (inches)	12	24	24	24		
Pile Type	Timber	Steel Pipe			Steel H	Steel Sheet
Total # of Piles	268	31	31	24	80	80
Vibratory Pile Driving						
Total Quantity	268	31	31	24	80	80
Max # Piles Vibrated Per Day	25	6	10	10	4	4
Vibratory Time Per Pile (minutes)	10	10	10	20	15	15
Vibratory Time Per Day (hours)	4.2	1.0	1.7	3.3	1.0	1.0
Number of Days	10.7	5.2	3.1	2.4	20.0	20.0
Vibratory Time Total (hours)	44.7	5.2	5.2	8	20	20
Impact Pile Driving						
Total Quantity	--	--	--	10	32	32
Max # Piles Impacted Per Day	--	--	--	4	4	4
# of Strikes Per Pile	--	--	--	20	20	20
Impact Time Per Pile (minutes)	--	--	--	20	20	20
Impact Time Per Day (hours)	--	--	--	1.3	1.3	1.3
Number of Days	--	--	--	2.4	8.0	8.0
Impact Time Total (hours)	--	--	--	3	11	11
DTH Drilling						
Total Quantity	--	--	--	5	16	--
Max # of Piles Installed per Day	--	--	--	2	3	--
# of Strikes Per Pile	--	--	--	54000	54000	--
# of Strikes Per Second	--	--	--	4	4	--
Total Drilling Time Per Pile (minutes)	--	--	--	150	150	--
Actual Drilling Time Per Pile (minutes)	--	--	--	60	60	--
Time per Day (hours)	--	--	--	2	3	--
Number of Days	--	--	--	2.4	5.3	--
DTH Drilling Time Total (hours)	--	--	--	4.8	16	--

3 SPECIES COVERED UNDER THE IHA

There are three ESA-listed species under NMFS jurisdiction that have ranges that extend into the project area (humpback and fin whales and Steller sea lions). However, take has only been requested for Western Distinct Population Segment (WDPS; DPS) Steller sea lions that are known to frequent the area (Table 4). Take has also been requested for northern sea otters, harbor seals, killer whales, and Dall's porpoise, which are not listed under the ESA. For additional information about species with ranges in the project action area, see Appendix A.

Table 4. Species Known to Occur in Project Area and Requested Take Types and Numbers (may be updated following issuance of IHAs)

Species	Hearing Group	Level A	Level B
Phase I			
Steller Sea Lion (WDPS; *Eumetopias jubatus*)	Otariid (OW)	102	1,305
Northern Sea Otter (*Enhydra lutris kenyoni*)	Otariid (OW)	30	790
Harbor Seal (*Phoca vitulina*)	Phocid (PW)	114	1,114
Killer Whale (*Orcinus orca*)	Mid-Frequency (MF) Cetacean	0	107
Dall's Porpoise (*Phocoenoides dalli*)	High-Frequency (MF) Cetacean	0	33
Phase II			
Steller Sea Lion (WDPS; *E. jubatus*)	OW	--	--
Northern Sea Otter (*E. lutris kenyoni*)	OW	97	244
Harbor Seal (*P. vitulina*)	PW	199	613

There are various ESA-listed and MMPA-listed species with habitat ranges that overlap with the ensonified area of the project; however, these species have not been observed in the project area. No Level A or B take is requested for the following species: humpback whale (ESA-listed, *Megaptera novaeangliae*), fin whale (ESA-listed, *Balaenoptera physalus*), northern fur seal (*Callorhinus ursinus*), pacific white-sided dolphin (*Lagenorhynchus obliquidens*), harbor porpoise (*Phocoena phocoena*), minke whale (*Balaenoptera acutorostrata*), and gray whale (*Eschrichtius robustus*). In-water project construction activities will be shut down if any individuals of these species or any other species not listed in Table 4 are observed approaching the Level B shutdown zone to ensure there is no Level A or B take of these species.

4 MONITORING AND SHUTDOWN ZONES

The project site is delineated into six units based on construction activities and the capacity for sound to travel based on physical barriers such as the harbor breakwater and Spike Island. Monitoring and shutdown zones are outlined based on these units presented in Figure 2.

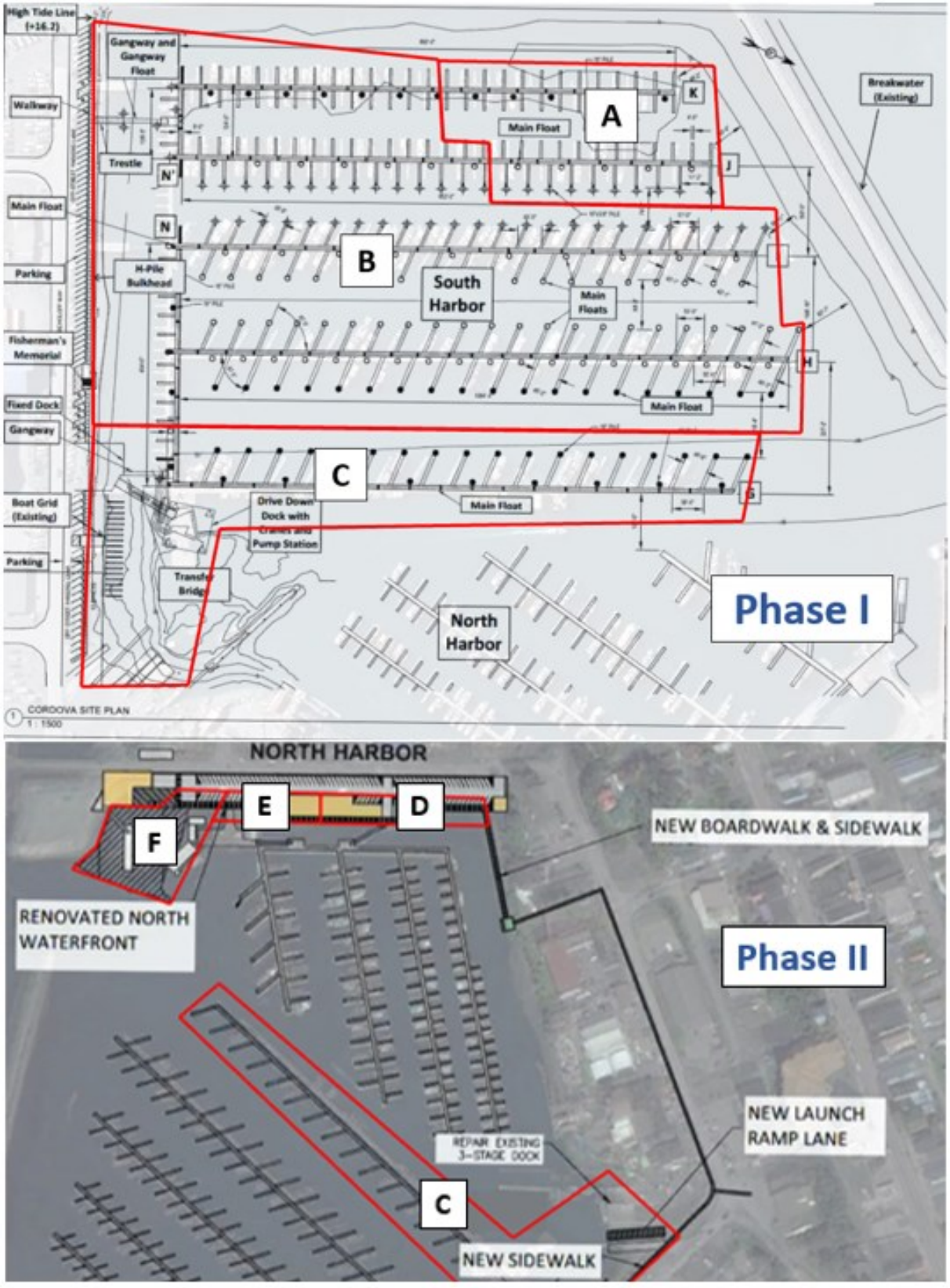
The harassment zones will be monitored throughout the permitted in-water or over-water construction activity. The following mitigation measures will be taken based on species, in-water activity, and distance of the mammalian from the project location:

- If a permitted marine mammal enters a Level B monitoring zone, a Level B take will be recorded and animal behaviors documented. Permitted construction activities would continue without cessation unless the animal approaches or enters the shutdown zone.
- If a marine mammal approaches or appears in a Level A shutdown zone, all permitted construction activities will immediately halt until the marine mammal has left the shutdown zone or has not been sighted for 15 minutes (pinnipeds and small cetaceans) or 30 minutes (large cetaceans and sea otters).
- If a non-permitted marine mammal approaches or appears in a Level B zone, all permitted construction activities will immediately halt until the marine mammal has left the Level B zone or has not been sighted for 15 minutes (pinnipeds, small cetaceans, and otters) or 30 minutes (large cetaceans and sea otters).

Takes, in the form of Level A or Level B harassment, of marine mammals other than permitted species are not authorized and will be avoided by shutting down construction activities before these species enter the Level B monitoring zone.

Because species are impacted differently by noise, species-specific monitoring and shutdown zones have been calculated for this project. These monitoring and shutdown zones are summarized in Table 5 and Table 6 and Figure 3 and Figure 4. Figures of the monitoring and shutdown zones are also provided in Appendix B.

Figure 2. Cordova Harbor Rebuild Project Proposed Action Area Units



4.1 Level A Monitoring and Shutdown Zones

Shutdown zones are defined as areas where sound pressure levels (SPLs) meet or exceed the level that would cause auditory injury to marine mammals. Level A shutdown zones are intended to protect marine mammals from auditory injury. In-water activities would be halted upon the sighting of a marine mammal that is in (or anticipated to enter) the shutdown zone. For select species where Level A take has been requested, the Level A zone will function as a monitoring zone to observe and record if Level A take occurs.

Further, there will be a nominal 10-meter shutdown zone for construction activity where acoustic injury is not the primary concern. This type of work could include (but is not limited to) the following activities: movement of the barge to the pile location; positioning of the pile on the substrate via a crane (i.e., stabbing the pile); and removal of the pile from the water column/substrate via a crane (i.e., deadpull). For these activities, monitoring would take place starting 15 minutes before initiation and ending when the action is complete. This can be monitored by the vessel operator or construction personnel when a PSO is not present. Radial distances to Level A shutdown zone boundaries are defined in Table 5 and shown in Figure 3 below.

Table 5. Cordova Harbor Rebuild Project Level A Monitoring and Shutdown Zones – Phase I and II (Figure 3 Legend)

Unit	Method	Pile Type	Distance (Meters)	Hearing Group
Unit A	**Barge movements, pile positioning**		10	MF OW PW HF
	Vibratory	24-inch steel removal, 24-inch timber removal	10	MF OW
			25	PW
			35	HF
		24-inch templates, 16-inch, 18-inch	10	MF OW PW
			25	HF
		30-inch	10	MF OW PW
			25	HF
	Impact	16-inch, 18-inch	10	MF OW
			75	PW
			185	HF
		30-inch	25	MF
			35	OW
			360	PW
			500	HF
	DTH	16-inch, 18-inch	35	MF
			40	OW
			500	PW HF
		30-inch	75	MF OW
			500	PW HF
Unit B	**Barge movements, pile positioning**		10	MF OW PW HF
	Vibratory	24-inch steel removal, 24-inch timber removal	10	OW MF
			25	PW
			35	HF
		24-inch templates, 16-inch, 18-inch	10	OW PW MF
			25	HF
		30-inch	10	MF OW PW
			25	HF
	Impact	16-inch, 18-inch	10	MF OW
			75	PW
			185	HF
		30-inch	25	MF
			35	OW
			360	PW
			800	HF
	DTH	16-inch, 18-inch	35	MF
			40	OW
			500	PW
			1,080	HF
		30-inch	75	MF OW
			925	PW
			2,050	HF

Table 5. Cordova Harbor Rebuild Project NMFS-Managed Species Level A Monitoring and Shutdown Zones – Phase I and II (Figure 3 Legend; *continued*)

Unit	Method	Pile Type	Distance (Meters)	Hearing Group
Unit C	**Barge movements, pile positioning**		10	MF OW PW HF
	In-water fill		100	MF OW PW HF
	Vibratory	24-inch steel removal, 24-inch timber removal	10	MF OW
			25	PW
			35	HF
		24-inch templates, 16-inch, 18-inch, 24-inch	10	MF OW PW
			25	HF
		30-inch	10	MF OW PW
			25	HF
	Impact	16-inch, 18-inch, 24-inch	10	MF OW
			75	PW
			185	HF
		30-inch	25	MF
			35	OW
			360	PW
			800	HF
	DTH	16-inch, 18-inch, 24-inch	35	MF
			40	OW
			500	PW
			850	HF
		30-inch	75	MF OW
			850	PW HF
Unit D	**Barge movements, pile positioning**		10	MF OW PW HF
	Vibratory	24-inch templates, sheet piles, H-piles	10	MF OW PW
			25	HF
	Impact	H-piles	25	OW PW
			185	MF
			410	HF
		Sheet piles	75	OW PW
			850	MF
			1,885	HF
	DTH	H-piles	75	MF OW
			925	PW
			2,050	HF

Table 5. Cordova Harbor Rebuild Project NMFS-Managed Species Level A Monitoring and Shutdown Zones – Phase I and II (Figure 3 Legend; *continued*)

Unit	Method	Pile Type	Distance (Meters)	Hearing Group
Unit E	**Barge movements, pile positioning**		10	OW PW HF MF
	Vibratory	24-inch templates, sheet piles, H-piles	10	OW PW MF
			25	HF
	Impact	H-piles	25	OW MF
			185	PW
			410	HF
		Sheet piles	75	OW MF
			850	PW
			1,885	HF
	DTH	H-piles	75	OW MF
			925	PW
			2,050	HF
Unit F	**Barge movements, pile positioning, dredging**		10	MF OW PW HF
	Vibratory	24-inch templates, 24-inch, H, and sheet piles	10	MF OW PW
			25	HF
		24-inch timber removal	10	OW MF
			25	PW
			35	HF
	Impact	24-inch	10	OW MF
			75	PW
			185	HF
		H-piles	25	OW MF
			185	PW
			410	HF
		Sheet piles	75	OW MF
			850	PW
			1,885	HF
	DTH	24-inch	35	MF
			40	OW
			500	PW
			1,080	HF
		H-piles	75	MF OW
			925	PW
			2,050	HF

Figure 3. Cordova Harbor Rebuild Project Distances to Level A Shutdown Zones

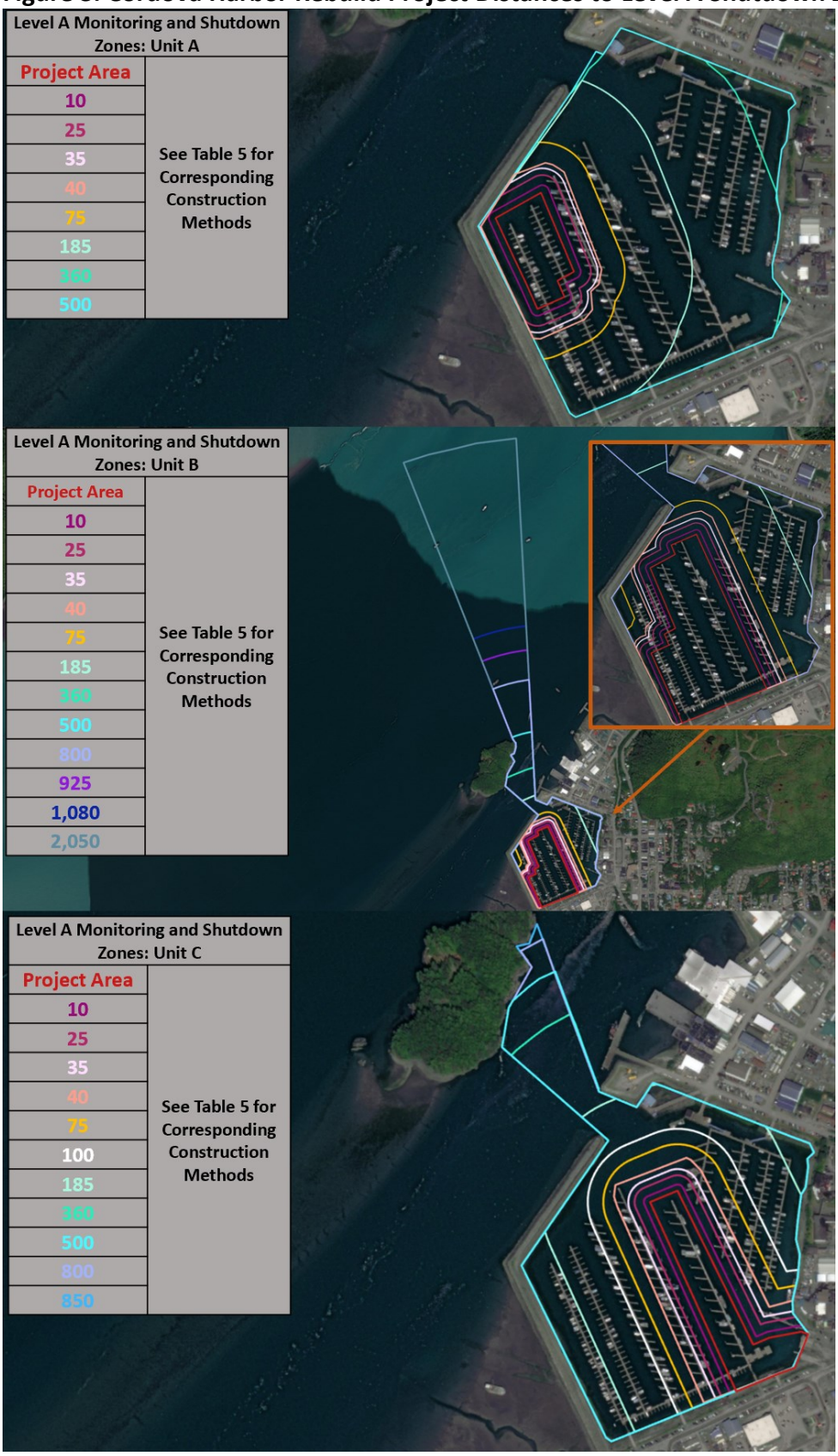
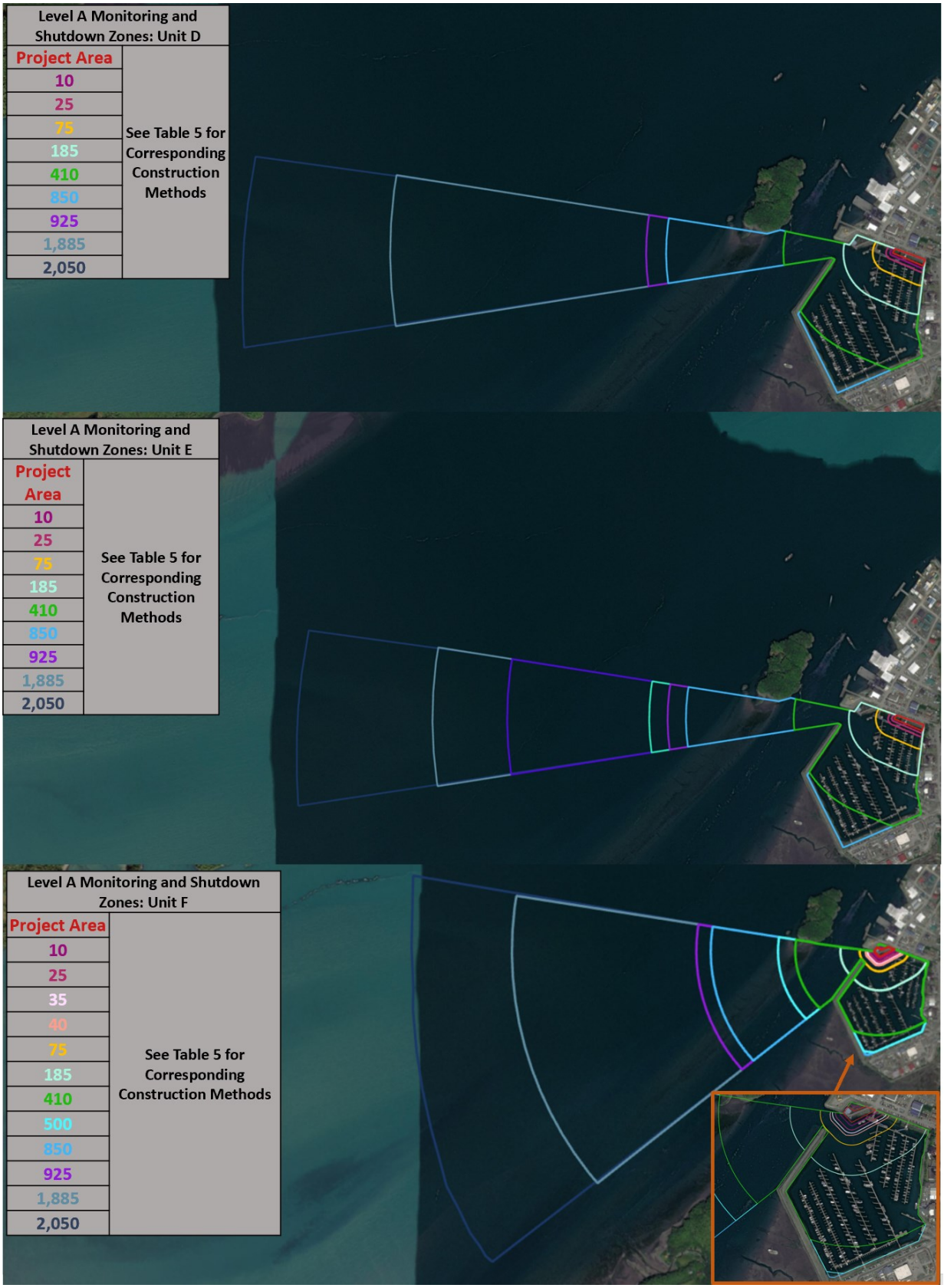


Figure 3. Cordova Harbor Rebuild Project Distances to Level A Shutdown Zones (*continued*)



4.2 Level B Monitoring and Shutdown Zones

Level B monitoring and shutdown zones have been determined based on in-water activity type. Level B monitoring zones represent areas where the SPLs generated from pile driving activities meet or exceed 120 dB root mean square (rms) during vibratory pile driving and DTH drilling and 160 dB rms during impact pile driving.

These monitoring zones serve as an area within which instances of permitted marine mammal harassment (Level B Take) will be documented, if in-water work is actively occurring. Alternatively, for non-permitted marine mammals, it acts as a shutdown area in which in-water work should cease if they approach or appear likely to enter. These Level B zones also allow PSOs to be aware of the presence of permitted marine mammals as they near the shutdown zone and prepare for shutdowns if required. Level B monitoring/shutdown zones are presented in Table 6 and Figure 4 below.

Table 6. Cordova Harbor Rebuild Project Level B Monitoring and Shutdown Zones – Phase I and II (Figure 4 Legend)

Unit	Method	Pile Type	Distance (Meters)
Unit A	Vibratory	24-inch timber removal, 24-inch steel removal, 24-inch templates, 16-inch, 18-inch, 30-inch	25 (Sea Otters)
		24-inch timber removal, 24-inch steel removal, 24-inch templates, 16-inch, 18-inch, 30-inch	500
	Impact	16-inch, 18-inch	275
		30-inch	500
	DTH	16-inch, 18-inch	40 (Sea Otters)
		30-inch	100 (Sea Otters)
		16-inch, 18-inch, 30-inch	500
Unit B	Vibratory	In-air (Bulkhead)	25 (OW)
			70 (PW)
		24-inch steel removal, 24-inch timber removal, 24-inch templates, 16-inch, 18-inch, 30-inch	25 (Sea Otters)
			4,500
	Impact	In-air (Bulkhead)	25 (OW)
			70 (PW)
		16-inch, 18-inch	275
		30-inch	1,000
	DTH	16-inch, 18-inch	40 (Sea Otters)
		30-inch	100 (Sea Otters)
		16-inch, 18-inch, 30-inch	4,500
Unit C	In-water fill	N/A	300
	Vibratory	In-air (Bulkhead)	25 (OW)
			70 (PW)
		24-inch steel removal, 24-inch timber removal, 24-inch templates, 16-inch, 18-inch, 30-inch	25 (Sea Otters)
		24-inch timber and steel removal, 24-inch templates, 16-inch, 18-inch, 30-inch	850
	Impact	In-air (Bulkhead)	25 (OW)
			70 (PW)
		16-inch, 18-inch	275
		30-inch	850
	DTH	16-inch, 18-inch	40 (Sea Otters)
		30-inch	100 (Sea Otters)
		16-inch, 18-inch, 30-inch	850

Table 6. Cordova Harbor Rebuild Project Level B Monitoring and Shutdown Zones – Phase I and II (Figure 4 Legend)

Unit	Method	Pile Type	Distance (Meters)
Unit D	Vibratory	24-inch templates, H, and sheet piles	25 (Sea Otters)
		24-inch templates	5,425
		Sheet	6,310
		H piles	7,150
	Impact	H piles	350
			410 (HF only) *
		Sheet piles	1,000
			1,580 (LF only) *
			1,885 (HF only) *
	DTH	H piles	100 (Sea Otters)
			7,150
Unit E	Vibratory	24-inch templates, H, and sheet piles	25 (Sea Otters)
		24-inch templates	5,425
		Sheet	6,310
		H piles	10,000
	Impact	H piles	350
			410 (HF only) *
		Sheet piles	1,000
			1,580 (LF only) *
			1,885 (HF only) *
	DTH	H piles	100 (Sea Otters)
			15,850
Unit F	Vibratory	24-inch templates, 24-inch timber removal, 24-inch, H, and sheet piles	25 (Sea Otters)
		24-inch templates, 24-inch	5,425
		24-inch timber removal, Sheet piles	6,310
		H piles	10,000
	Impact	24-inch	275
		H piles	350
			410 (HF only) *
		Sheet piles	1,000
			1,580 (LF only) *
			1,885 (HF only) *
	DTH	24-inch	40 (Sea Otters)
			13,600
		H piles	100 (Sea Otters)
			36,400

* Indicates Level A zone. Where Level A zone radii are larger than the corresponding Level B radii, the Level A zone is shown.

Figure 4. Cordova Harbor Rebuild Project Monitoring Zones – Phase I and II

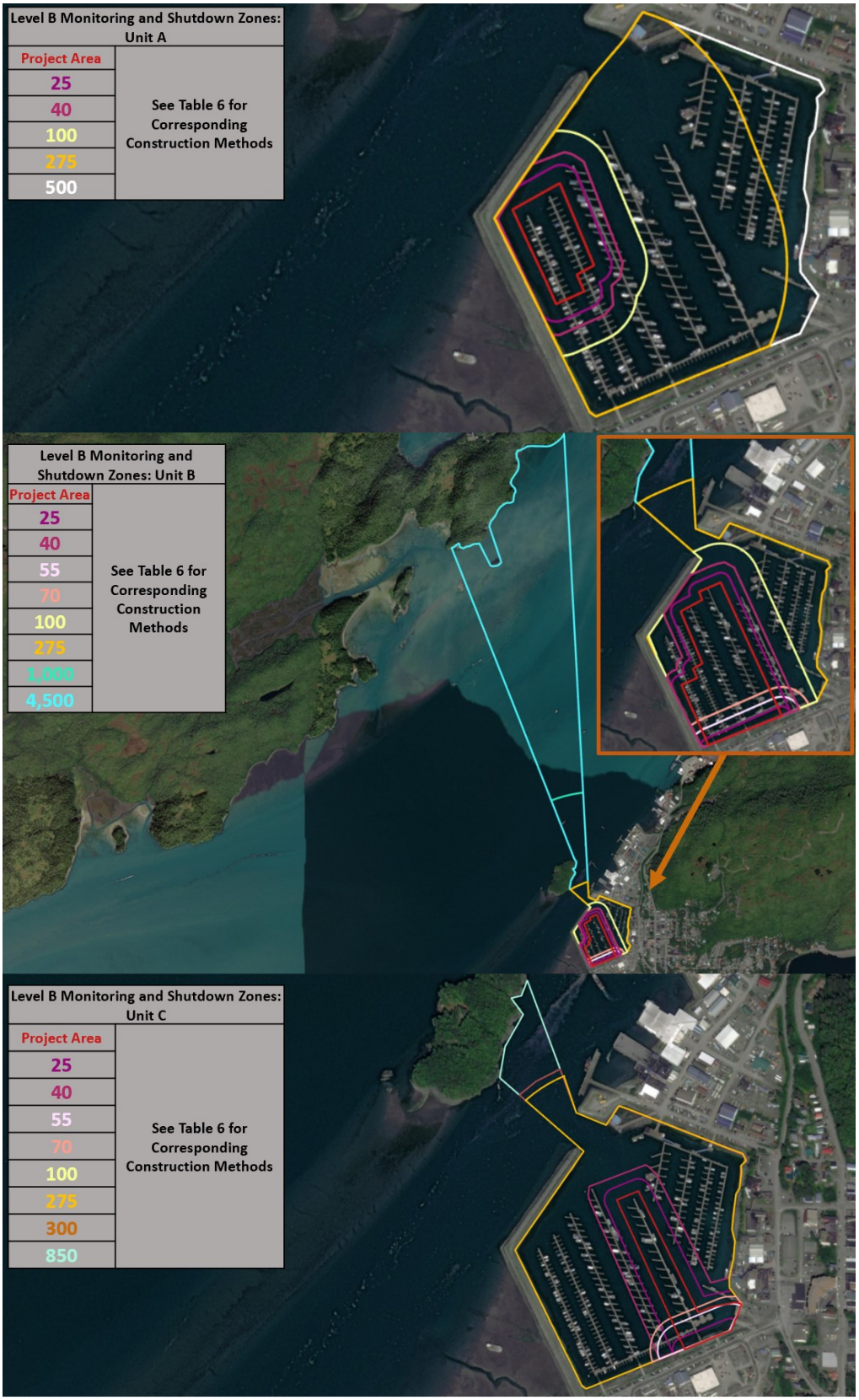
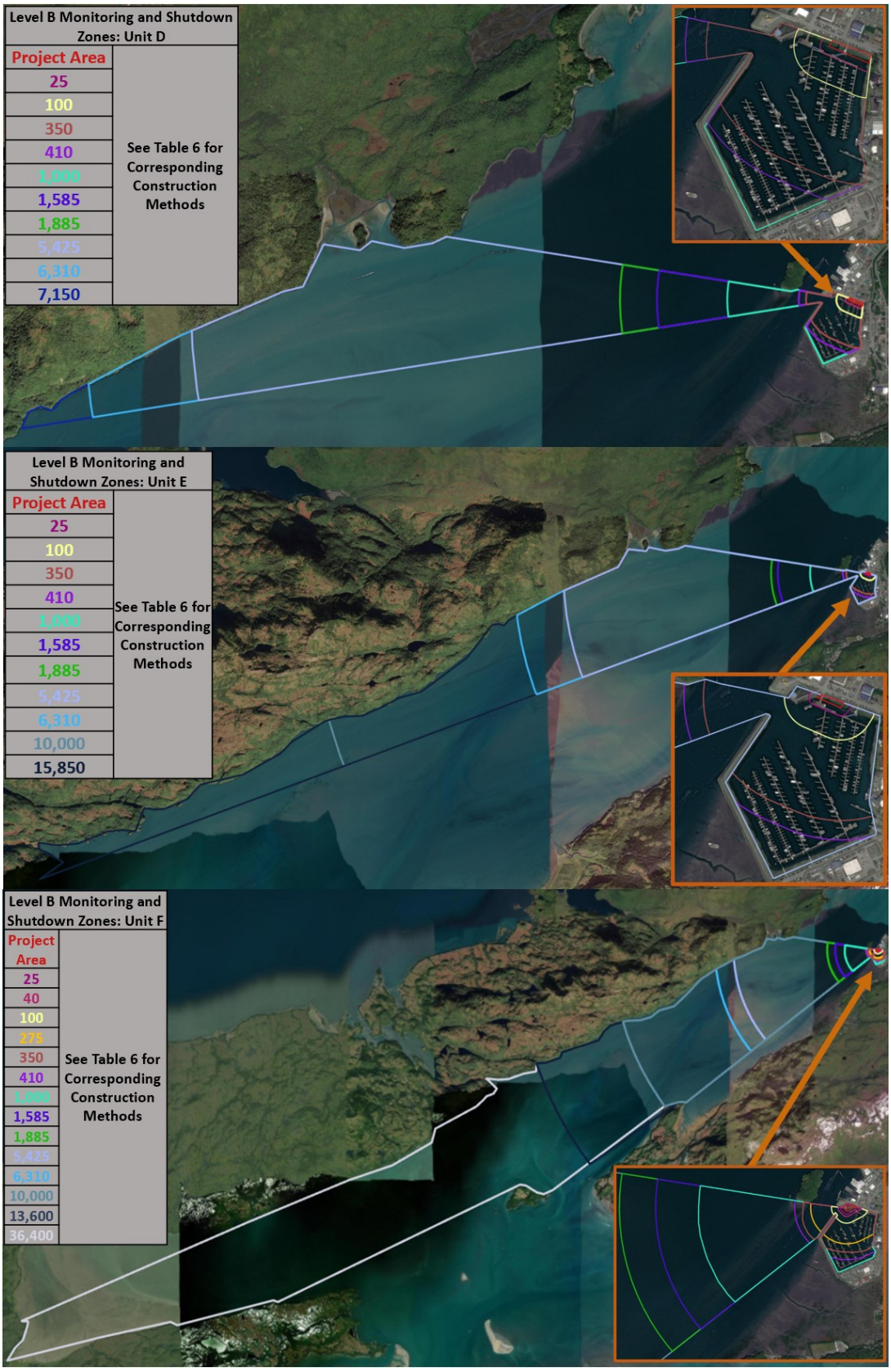


Figure 4. Cordova Harbor Rebuild Project Monitoring Zones – Phase I and II (*continued*)



5 MITIGATION MEASURES

The purpose of a marine mammal monitoring plan is to observe for marine mammals in the area where potential sound effects may occur. Work will be stopped or delayed if a non-permitted marine mammal is sighted in the Level B monitoring area or Level A shutdown area. Work will not begin or resume until the marine mammal has moved out of the monitoring area on its own accord.

The following mitigation measures will be implemented during in-water activities to limit impacts to marine mammals, including ESA-listed species.

5.1 General Conditions and Requirements

- The contractor is required to conduct briefings for construction supervisors and crews and the monitoring team prior to the initiation of pile driving activity and upon hiring new personnel to explain responsibilities, communication procedures, the marine mammal monitoring protocol, and operational procedures.
- The contractor is required to employ PSOs during all in-water construction activities.
- Marine mammal monitoring must take place starting 30 minutes prior to initiation of in-water work and ending 30 minutes after completion of in-water work. In-water work may commence when observers have declared the appropriate zones clear of marine mammals. In the event of a delay or shutdown of activity resulting from marine mammals in the shutdown zone (Table 5 and Table 6), their behavior must be monitored and documented until they leave of their own volition, at which point the activity may begin or resume.
- In-water work must be halted or delayed If a marine mammal is observed entering or within an established shutdown zone (Table 5 and Table 6). Pile driving may not commence or resume until either: the animal has voluntarily left and has been visually confirmed beyond the shutdown zone; 15 minutes have passed without subsequent observations of small cetaceans and pinnipeds; or 30 minutes have passed without subsequent observations of large cetaceans or sea otters.
- The contractor must use soft start techniques when impact pile driving.
- In-water work must be delayed or halted immediately if a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized takes are met, is observed approaching or within the monitoring zone (Table 5 and Table 6). Activities must not start or resume until the animal has been confirmed to have left the area or the observation time period, as indicated in the conditions above, has elapsed.

- Should light or environmental conditions deteriorate such that marine mammals within the entire largest Level A shutdown zone would not be visible (e.g., fog, heavy rain), pile driving and removal must be delayed until the PSOs are confident marine mammals within the shutdown zone could be detected.

- PSOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break between shifts, and will not perform PSO duties for more than 12 hours in a 24-hour period (to reduce PSO fatigue).

5.2 Observer Qualifications and Requirements

- Visual acuity in both eyes (correction is permissible) sufficient to discern moving targets at the water's surface and ability to estimate target size and distance. Use of binoculars and/or spotting scope may be necessary to correctly identify the target.
- Advanced education in biological science, wildlife management, mammalogy or related fields (Bachelor's degree or higher is preferred), or equivalent Alaska Native traditional knowledge. PSOs may substitute education or training for experience.
- Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience).
- Experience or training in field identification of marine mammals (cetaceans and pinnipeds).
- Training, knowledge of or experience with vessel operation and pile driving operations sufficient to provide personal safety during observations.
- Writing skills sufficient to prepare a report of observations. Reports should include: the number, type, and location of marine mammals observed; the behavior of marine mammals in the area of potential sound effects during construction; dates and times when observations and in-water construction activities were conducted; dates and times when in-water construction activities were suspended because of marine mammals; etc.
- Ability to communicate orally as needed, by radio or in person, with project personnel to provide real time information about marine mammals observed in the area.
- PSOs must be independent (i.e., not construction personnel) and have no other assigned tasks during monitoring periods.
- A lead observer or monitoring coordinator must be designated if a team of three or more PSOs are required. The lead observer must have prior experience working as a marine mammal observer during construction.
- The contractor must submit PSO CVs for approval by NMFS prior to the onset of pile driving.

5.3 Data Collection

5.3.1 Environmental Conditions and Construction Activities

PSOs will use the monitoring forms and construction activities log to document the following (Appendix C):

- Environmental Conditions
    - Environmental conditions will be recorded at the beginning and end of every monitoring period and as conditions change.

    - Recordings will include PSO names, location of the observation station, time and date of the observation, weather conditions, air temperature, sea state, cloud cover, visibility, glare, tide, and ice coverage (if applicable).
- Construction Activities:
    - PSOs will record the time that observations begin and end as well as the durations of shutdowns.
    - PSOs will document the reason for stopping work, time of shutdown, and type of pile installation or other in-water work taking place.
    - PSOs will document other, non-project-related activities that could disturb marine mammals in the area, such as the presence of large and small vessels.

PSOs will record all communications with the construction crew. The environmental conditions and construction activities log will be checked for quality assurance and quality control by the lead PSO for submission at the end of every monitoring day. Upon request, the data will be submitted to NMFS along with the final report.

5.3.2 Sightings

Observers will use an approved Marine Mammal Sighting Form and Grid Maps (Appendices D and E) which will be completed by each observer for each survey day and location. Sighting forms will be used by observers to record the following:

- Date and time that permitted construction activity begins or ends;
- Weather parameters (e.g., percent cloud cover, percent glare, visibility) and sea state (determined by the Beaufort Wind Force Scale);
- Species, numbers, and, if possible, sex and age class of observed marine mammals;
- Construction activities occurring during each sighting;
- Behavioral patterns observed, including bearing and direction of travel;
- Behavioral reactions just prior to, or during, soft-start and shutdown procedures;
- The marine mammal's location, distance from the observer, and distance from pile removal activities;
- Whether mitigation measures, including shutdown procedures, were required by an observation, including the duration of each shutdown;
- Observer rotations including the time of rotation and the initials of the incoming observer.

The observation record forms will be checked for quality assurance and quality control by the lead PSO for submission at the end of every monitoring day. Upon request, the data will be submitted to NMFS, and it will be included with the final report.

5.4 Equipment

The following equipment will be required to conduct observations for this project:

- Appropriate Personal Protective Equipment;
- Portable VHF radios for the observers to communicate with other observers and the pile driving supervisor;
- Cellular phone as backup for radio communication;
- Contact information for the other observers, the pile driving supervisor, and the NMFS point of contact;
- Daily tide tables for the project area;
- Binoculars (quality 7 x 50 or better) and a rangefinder;
- Hand-held GPS unit, map and compass, or grid map to record locations of marine mammals;
- Copies of the 4MP, IHA, and other relevant permit requirement specifications in a sealed, clear, plastic cover;
- Notebook with pre-standardized monitoring Observation Record forms and Grid Maps (Appendices D and E).

5.5 Number and Location of PSOs

The number of locations of observers are determined to ensure that there is full coverage of the entire action area during all in-water activities. Locations are chosen based on site accessibility and field of vision.

5.5.1 South Harbor Locations

One to three PSOs will be onsite during in-water activities in the South Harbor associated with the Cordova Harbor Rebuild Project, stationed in the following locations (Figure 5):

- PSO 1: stationed along the South Harbor parking area
- PSO 2: stationed on the Breakwater Trail
- PSO 3: stationed at a viewpoint along New England Cannery Road.

The number and locations of monitors will be based on the following in-water work scenarios presented in Table 7.

Table 7. Cordova Harbor Rebuild Project South Harbor PSO Scenarios

Unit	Construction	Piles	PSO Locations
Unit A	Vibratory	24-inch timber removal, 24-inch steel removal, 24-inch templates, 16-inch, 18-inch, 30-inch	PSO 1
	Impact	16-inch, 18-inch, 30-inch	PSO 1
	DTH	16-inch, 18-inch, 30-inch	PSO 1
Unit B	Vibratory	In-air (Bulkhead)	PSO 1
		24-inch steel removal, 24-inch timber removal, 24-inch templates, 16-inch, 18-inch, 30-inch	PSO 1, PSO 2, PSO 3
	Impact	In-air (Bulkhead), 16-inch, 18-inch	PSO 1
		30-inch	PSO 1 and PSO 2

Unit	Construction	Piles	PSO Locations
	DTH	16-inch, 18-inch, 30-inch	PSO 1, PSO 2, PSO 3
Unit C	Vibratory	In-air (Bulkhead)	PSO 1
		24-inch timber and steel removal, 24-inch templates, 16-inch, 18-inch, 30-inch	PSO 1 and PSO 2
	Impact	In-air (Bulkhead), 16-inch, 18-inch	PSO 1
		30-inch	PSO 1 and PSO 2
	DTH	16-inch, 18-inch, 30-inch	PSO 1 and PSO 2

5.5.2 North Harbor Locations

Two to four PSOs will be onsite during in-water activities in the North Harbor associated with the Cordova Harbor Rebuild Project, stationed in the following locations (Figure 6):

- PSO 1: stationed along the North Harbor parking area
- PSO 2: stationed on the Breakwater Trail
- PSO 3: stationed at a viewpoint along the shore near Saddle Point
- PSO 4: stationed at a viewpoint along Whitshed Road.
- PSO 5: roving on a boat in Orca Inlet[2]

The number and locations of monitors will be based on the following in-water work scenarios presented in Table 8.

Table 8. Cordova Harbor Rebuild Project North Harbor PSO Scenarios

Unit	Construction	Piles	PSO Locations
Unit D	Vibratory	24-inch templates, sheet, and H-piles	PSO 1, PSO 2, PSO 3
	Impact	Sheet and H-piles	PSO 1 and PSO 2
	DTH	H piles	PSO 1, PSO 2, PSO 3
Unit E	Vibratory	24-inch templates and sheet pile	PSO 1, PSO 2, PSO 3
		H piles	PSO 1, PSO 2, PSO 3, PSO 4
	Impact	Sheet and H-piles	PSO 1 and PSO 2
	DTH	H piles	PSO 1, PSO 2, PSO 3, PSO 4, PSO 5
Unit F	Dredging	N/A	PSO 1 and PSO 2
	Vibratory	24-inch timber removal, 24-inch templates, 24-inch, sheet, and H-piles	PSO 1, PSO 2, PSO 3, PSO 4
	Impact	24-inch	PSO 1
		Sheet and H-piles	PSO 1 and PSO 2
	DTH	24-inch, H piles	PSO 1, PSO 2, PSO 3, PSO 4, PSO 5

[2] A boat-based PSO would only be used when the tide is sufficiently high enough for a boat to access southern Orca Inlet while DTH drilling was occurring in Unit E and Unit F because the mudflats in Orca Inlet are exposed at a zero tide.

Figure 5. Cordova Harbor Rebuild Project South Harbor PSO Locations

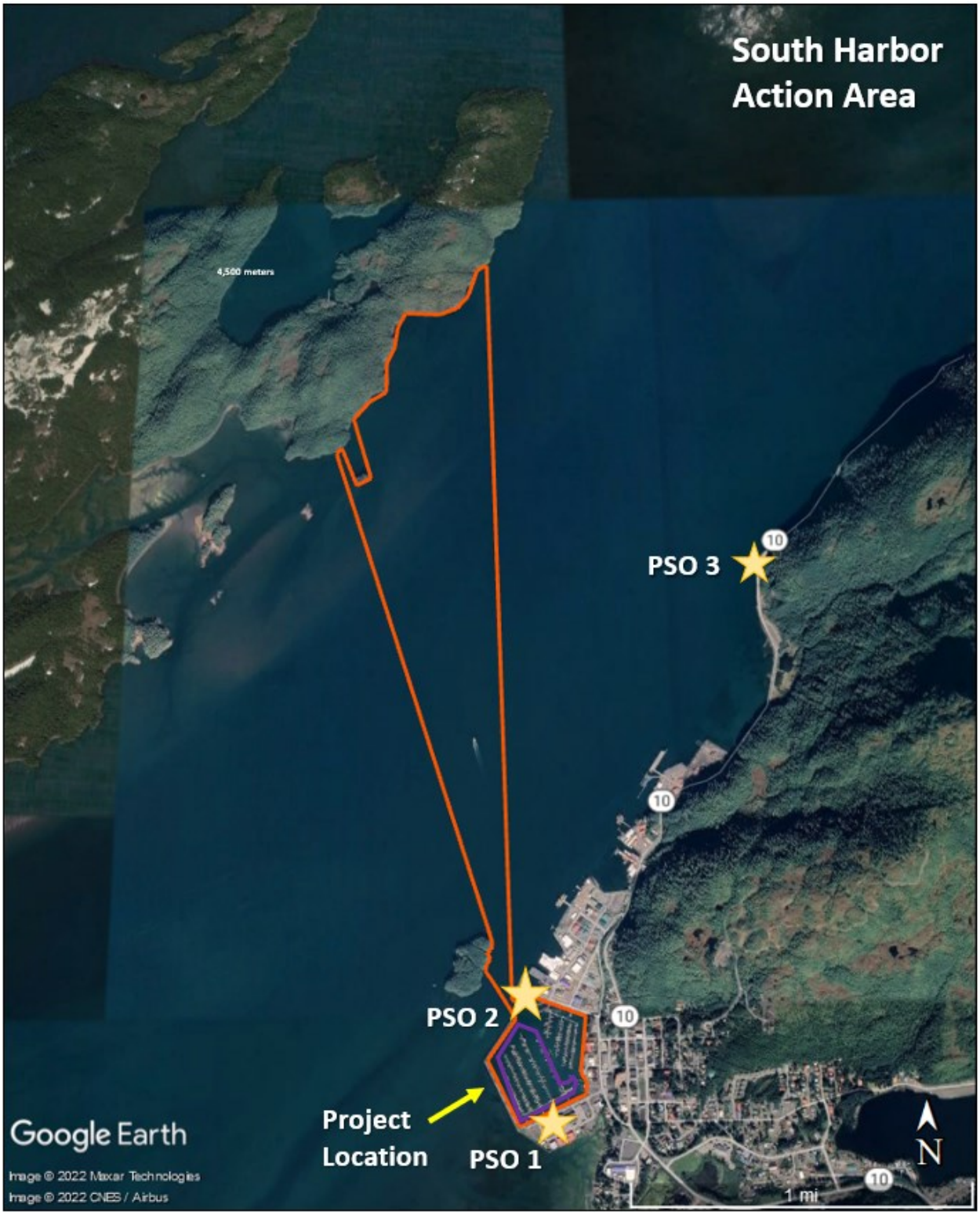


Figure 6. Cordova Harbor Rebuild Project North Harbor PSO Locations

5.6 Strike Avoidance

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

- Do not approach, or cause a vessel or object to approach, within 100 yards of a humpback whale;
- Do not obstruct the path of oncoming humpback whales causing them to surface within 100 yards of the vessel;
- Do not disrupt the normal behavior or prior activity of a whale; and Operate at a slow, safe speed when near a humpback whale (safe speed is defined in regulation 33 CFR § 83.06).

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

5.7 Monitoring Techniques

5.7.1 Pre-Activity Monitoring

The following monitoring methods will be implemented before permitted construction begins:

- The lead PSO and Contractor Superintendent will meet at the start of each day to discuss planned construction activities for the day and to conduct a radio/phone check.
- Prior to the start of permitted activities, observers will conduct a 30-minute pre-watch of the shutdown and monitoring zones. They will ensure that no marine mammals are present within the shutdown zone before permitted activities begin.
- The shutdown zone will be cleared when marine mammals have not been observed within the zone for the 30-minute pre-watch period. If a marine mammal is observed within the shutdown zone, a soft-start cannot proceed until the animal has left the zone or has not been observed for 15 minutes (for pinnipeds) or 30 minutes (for cetaceans and sea otters).
- When all applicable exclusion zones are clear, the observers will radio the pile driving supervisor. Permitted activities will not commence until the pile driving supervisor receives verbal confirmation that the zones are clear.
- If permitted species are present within the monitoring zone, work will not be delayed, but observers will monitor and document the behavior of individuals that remain in the monitoring zone.
- In case of fog or reduced visibility, observers must be able to see all of the shutdown zones before permitted activities can begin.

5.7.2 Soft Start Procedures

Soft start procedures will be used prior to periods of vibratory and impact driving to allow marine mammals to leave the area prior to exposure to maximum noise levels.

- For vibratory hammers, the contractor shall run the vibratory hammer for no more than 30 seconds followed by a quiet period of at least 60 seconds without vibratory removal of piles. This process shall be repeated twice more within 10 minutes before beginning vibratory removal operations that last longer than 30 seconds.
- For impact hammers, the contractor will initiate approximately three strikes at a reduced energy level, followed by a 30-second waiting period. This procedure would be repeated twice more.
- If work ceases for more than 30 minutes, soft start procedures must be used prior to continuing work.

5.7.3 During Activity Monitoring

If permitted species are observed within the monitoring zone during permitted activities, a Level B takes will be recorded and behaviors will be documented. Work will not stop unless an animal enters or appears likely to enter the shutdown zone.

5.7.4 Inclement Weather

Orca Inlet and the Cordova Harbor occasionally experience increased sea states and inclement weather. If inclement weather, limited visibility, or increased sea state restricts the observers' ability to make observations, in-water activities will not be initiated or continued until the largest Level A shutdown zone for the activity is visible.

If visibility is diminished, but the parameters for initiating or continuing work, referenced above, are met the following should occur:

- All appropriate PSO locations for the planned in-water activities should be occupied for the entirety of the monitoring period regardless of visibility.
- All PSO locations should collectively determine what percentage of the Level B zone is visible for use in calculating extrapolations. The lead PSO should document this with time stamps as conditions change and this percentage should be adopted by all PSO locations.
- Extrapolate takes for each species with authorized take using the equation below.

Percentage of visible Level B zone ÷ Number of individuals sighted in the visible portion of the Level B zone = extrapolated takes for species

5.7.5 Shutdowns

If a marine mammal enters or appears likely to enter its respective shutdown zone:

- The observers will immediately alert the pile driving supervisor.
- All permitted activities will immediately halt.
- In the event of a shutdown, permitted pile installation or removal activities may resume only when the animal(s) within or approaching the shutdown zone has been visually confirmed beyond or heading away from the shutdown zone, or 15 minutes (for pinnipeds) or 30 minutes (for cetaceans and sea otters) have passed without observation of the animal. Observers will contact the pile driving supervisor and inform them that activities can re-commence.

5.7.6 Breaks in Work

Shutdown and monitoring zones will continue to be monitored during an in-water construction delay. No exposures will be recorded for permitted species in the monitoring zone if there are no concurrent permitted construction activities.

If permitted activities cease for more than 30 minutes and monitoring has not continued, pre-activity monitoring and soft start procedures must recommence. This includes breaks due to scheduled or unforeseen construction practices or breaks due to permit-required shutdown. Work can begin following the 30-minute pre-watch monitoring protocols. Work cannot begin if an animal is within the shutdown zone or if visibility is not clear throughout the Level A shutdown zones.

5.7.7 Post Activity Monitoring

Monitoring of the shutdown and monitoring zones will continue for 30 minutes following completion of in-water activities. PSOs will continue to record observations during this post-watch period, with a focus on observing and reporting unusual or abnormal behaviors.

If construction were to resume during the post-watch period, PSOs will follow pre-watch protocols to ensure that that the shutdown and monitoring zones are clear prior to work resuming.

6 REPORTING

6.1 Notification of Intent to Commence Construction

The contractor will inform NMFS Alaska Region Permits Division and USFWS Alaska Region 3M one week prior to commencing construction activities.

6.2 Weekly Sighting Counts

A summary of the following will be submitted to the construction project manager at the conclusion of each week of construction activity (Friday evening):

- Completed monitoring forms for the week
- Completed environmental conditions and construction activity logs for the week
- Preliminary counts of sightings and takes per species

6.3 Interim Monthly Reports

The contractor will submit brief, monthly reports to the NMFS Alaska Region Permits Division and USFWS Alaska Region 3M summarizing PSO observations and recorded takes during construction. Monthly reporting will allow NMFS to track takes (including extrapolated takes) and reinitiate consultation in a timely manner, if necessary. Monthly reports will be submitted by email to NMFS at akr.section7@noaa.gov and to USFWS at fw7_mmm_reports@fws.gov.

The reporting period for each monthly PSO report will be the entire calendar month, and reports will be submitted by the end of business hours on the tenth day of the month following the end of the reporting period (e.g., the monthly report covering September 1–30, 2023, would be submitted to the NMFS and USFWS by close of business on October 10, 2023).

6.4 Final Report

The contractor will submit a draft final report by email to NMFS at akr.section7@noaa.gov and to USFWS at fw7_mmm_reports@fws.gov no later than 90 days following the end of construction activities. The contractor will provide a final report within 30 days following resolution of NMFS 's and USFWS's comments on the draft report. If no comments are received from the agencies within 30 days, the draft final report will be considered the final report.

The final reports will contain, at minimum, the following information:

- A summary of construction activities, including start and end dates.
- A description of any deviation from the initially proposed pile numbers, pile types, average driving times, etc.
- A table summarizing all marine mammal sightings during the construction period, including:
    - dates, times, species, numbers, locations, and behaviors of any observed ESA-listed marine mammals, including all observed humpback whales and Steller sea lions;
    - daily average number of individuals of each species (differentiated by month as appropriate) detected within the Level A and Level B zones, and whether estimated as taken, if appropriate; and
    - the number of shut-downs throughout all monitoring activities.
- A brief description of any impediments to obtaining reliable observations during construction period.
- A description of any impediments to complying with these mitigation measures.
- Appendices containing all PSO daily logs and marine mammal sighting forms.

6.5 Reporting Injured or Dead Marine Mammals

If it is clear that project activity has caused the take of a marine mammal in a manner prohibited by the (requested) IHA, such as unauthorized Level A harassment, serious injury, or mortality, the contractor shall immediately cease the specified activities and report the incident the NMFS Alaska Region Permits Division and the NMFS statewide 24-hour Stranding Hotline (877) 925-7773. If a sea otter, report to the USFWS Marine Mammal Management Office at (800) 362–5148, or the Alaska SeaLife Center in Seward (888) 774–7325, or both.

The report must include the following:

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

Activities will not resume until NMFS or USFWS is able to review the circumstances of the unauthorized take. NMFS or USFWS would work with the contractor to determine what measures are necessary to minimize the likelihood of further unauthorized take and ensure ESA and MMPA compliance. The contractor may not resume their activities until notified by NMFS or USFWS.

In the event that the contractor discovers an injured or dead marine mammal within the action area, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (e.g., in less than a moderate state of decomposition), the contractor will immediately report the incident to the NMFS Permits Division or USFWS Alaska Region 3M, and the NMFS Alaska Regional Stranding Coordinator or Hotline.

The report must include the same information identified in the paragraph above. Activities may continue while NMFS or USFWS reviews the circumstances of the incident. NMFS or USFWS will work with the contractor to determine whether additional mitigation measures or modifications to the activities are appropriate.

In the event that the contractor discovers an injured or dead marine mammal and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), the contractor must report the incident to the NMFS Permits Division and the NMFS Alaska Regional Stranding Coordinator or Hotline within 24 hours of the discovery. If a sea otter, it must be reported to USFWS within 24 hours of the discovery to either the USFWS Marine Mammal Management Office at (800) 362–5148 (business hours), or the Alaska SeaLife Center in Seward (888) 774–7325 (24 hours a day), or both. The contractor will provide photographs, video footage (if available), or other documentation of the stranded animal sighting to NMFS or USFWS.

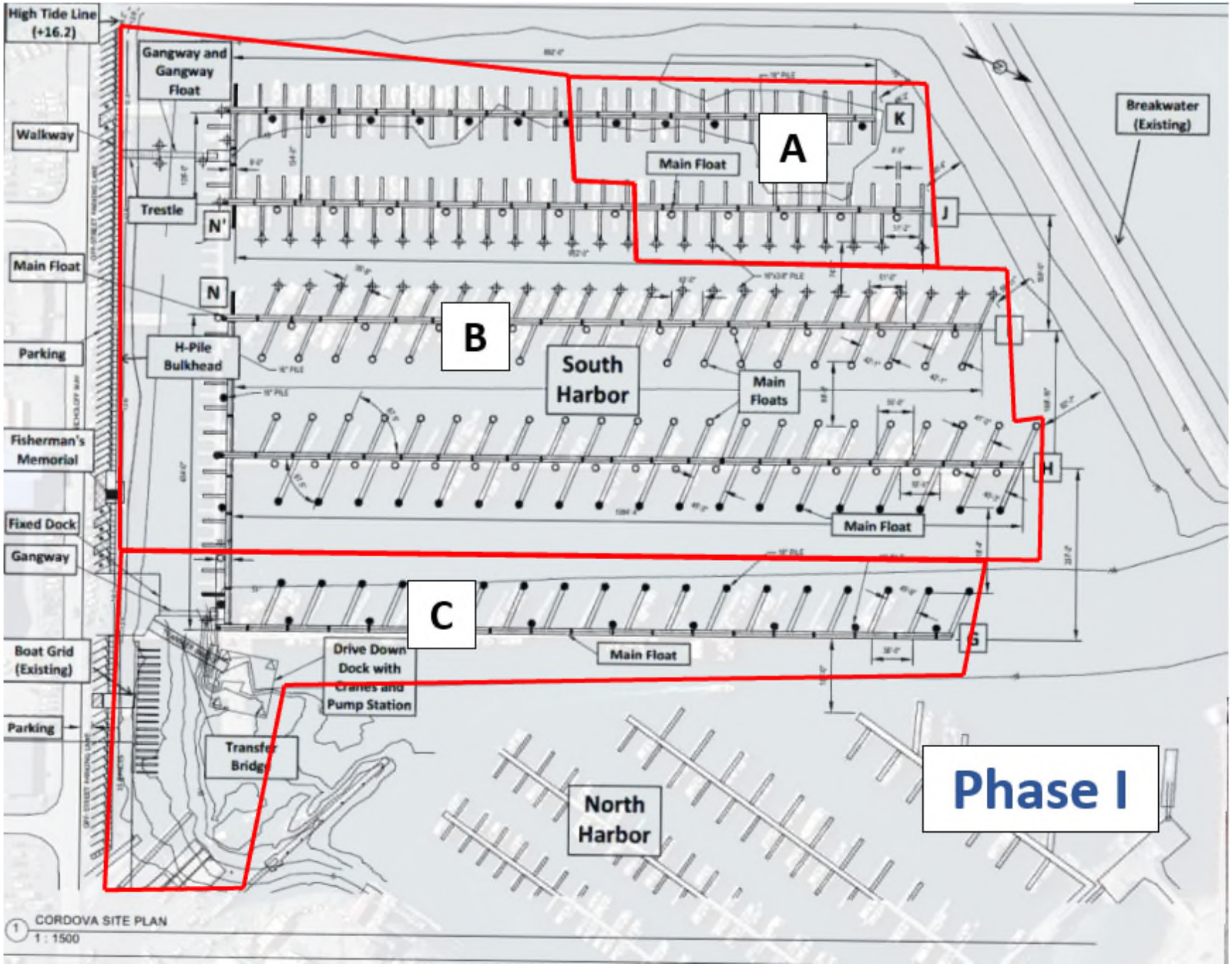
Appendix A: List of Species with Ranges in the Project Action Area

Species Under NMFS Jurisdiction that May Occur in the Project Vicinity

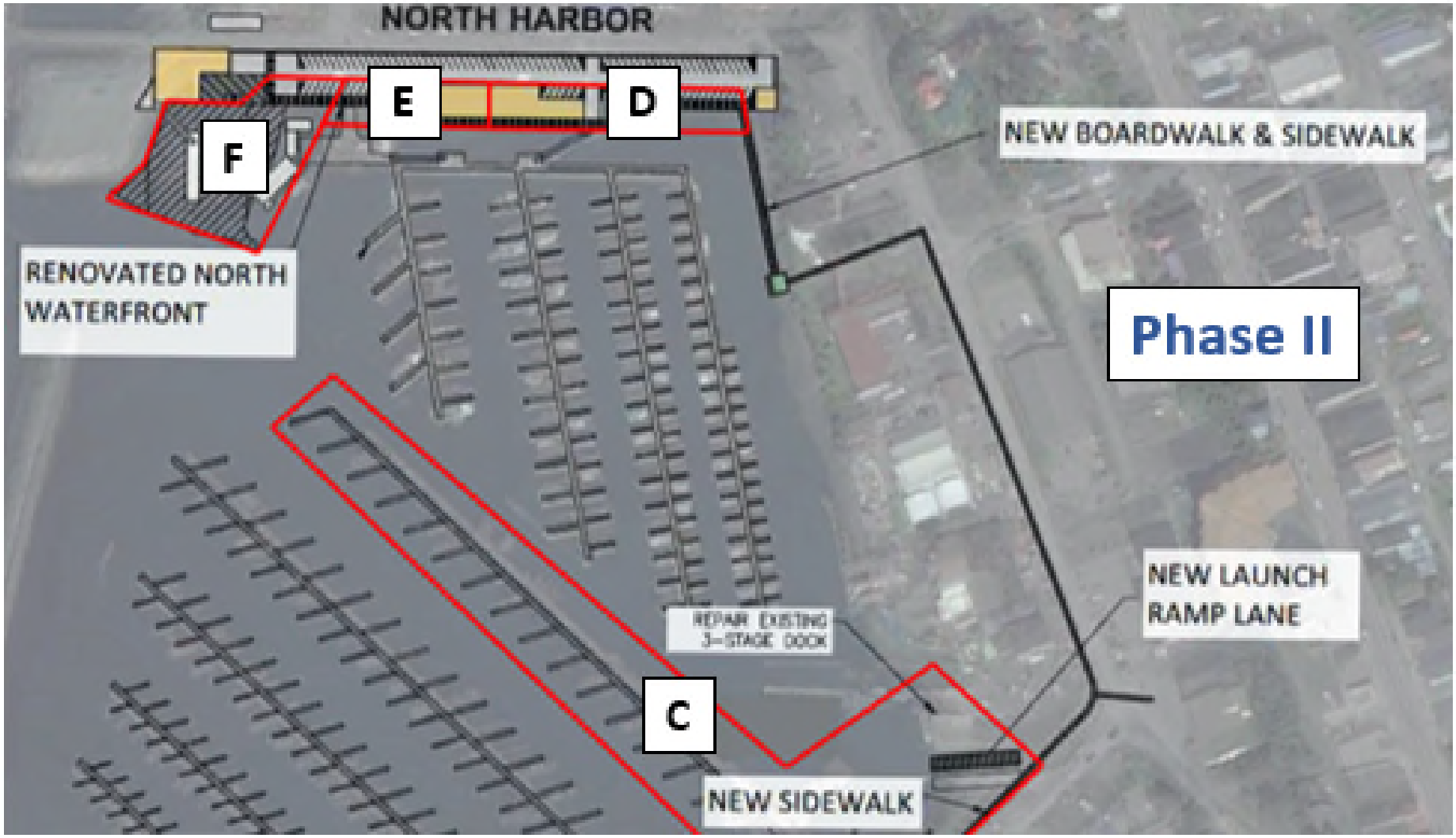
Species	Status Listing	Jurisdiction	Occurrence	Link to Species Profile
Steller Sea Lion (*Eumatopia jubatus*)	ESA Endangered (WDPS)	NMFS	Common	https://www.fisheries.noaa.gov/species/steller-sea-lion
Humpback Whale (*Megaptera novaeangliae*)	ESA Threatened Mexico DPS/ North Pacific DPS	NMFS	Rare	https://www.fisheries.noaa.gov/species/humpback-whale
Fin Whale (*Balaenoptera physalus*)	ESA Endangered	NMFS	Rare	https://www.fisheries.noaa.gov/species/fin-whale
Northern Sea Otter (*Enhydra lutris kenyoni)*	MMPA	USFWS	Common	https://www.fws.gov/species/northern-sea-otter-enhydra-lutris-kenyoni
Northern Fur Seal (*Callorhinus ursinus*)	MMPA	NMFS	Rare	https://www.fisheries.noaa.gov/species/northern-fur-seal
Harbor Seal (*Phoca vitulina*)	MMPA	NMFS	Common	https://www.fisheries.noaa.gov/species/harbor-seal
Pacific White-Sided Dolphin (*Lagenorhynchus obliquidens*)	MMPA	NMFS	Rare	https://www.fisheries.noaa.gov/species/pacific-white-sided-dolphin
Harbor Porpoise (*Phocoena phocoena*)	MMPA	NMFS	Infrequent	https://www.fisheries.noaa.gov/species/harbor-porpoise
Dall's Porpoise (*Phocoenoides dalli*)	MMPA	NMFS	Infrequent	https://www.fisheries.noaa.gov/species/dalls-porpoise
Minke Whale (*Balaenoptera acutorostrata*)	MMPA	NMFS	Rare	https://www.fisheries.noaa.gov/species/minke-whale
Gray Whale (*Eschrichtius robustus*)	MMPA	NMFS	Rare	https://www.fisheries.noaa.gov/species/gray-whale

Appendix B: Shutdown and Monitoring Zone Maps

Cordova Harbor Rebuild Project Action Area Units – Phase I

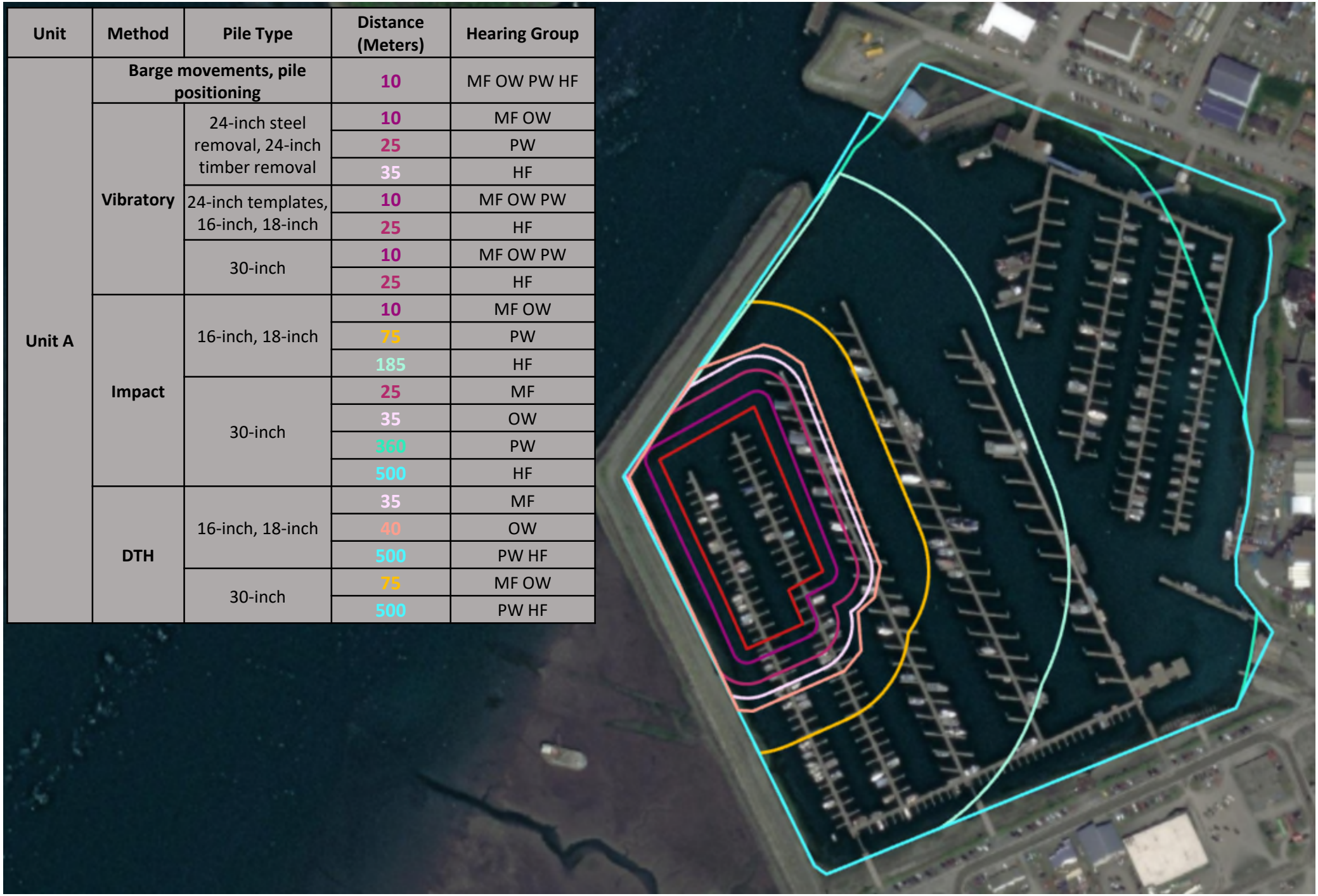


Cordova Harbor Rebuild Project Action Area Units – Phase II



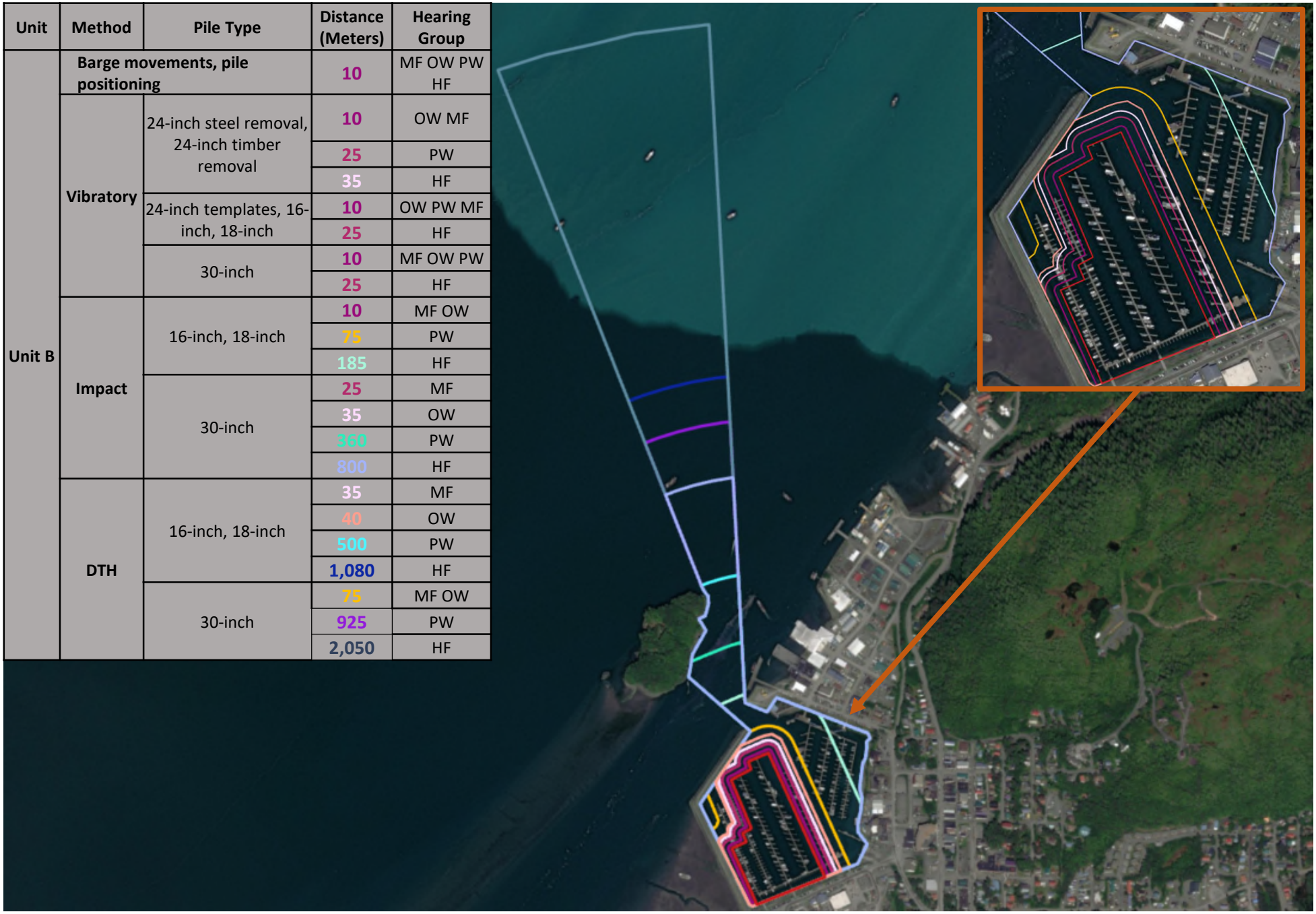
Cordova Harbor Rebuild Project Distances to Level A Monitoring and Shutdown Zones: Unit A

Unit	Method	Pile Type	Distance (Meters)	Hearing Group
Unit A	Barge movements, pile positioning		10	MF OW PW HF
	Vibratory	24-inch steel removal, 24-inch timber removal	10	MF OW
			25	PW
			35	HF
		24-inch templates, 16-inch, 18-inch	10	MF OW PW
			25	HF
		30-inch	10	MF OW PW
			25	HF
	Impact	16-inch, 18-inch	10	MF OW
			75	PW
			185	HF
		30-inch	25	MF
			35	OW
			360	PW
			500	HF
	DTH	16-inch, 18-inch	35	MF
			40	OW
			500	PW HF
		30-inch	75	MF OW
			500	PW HF



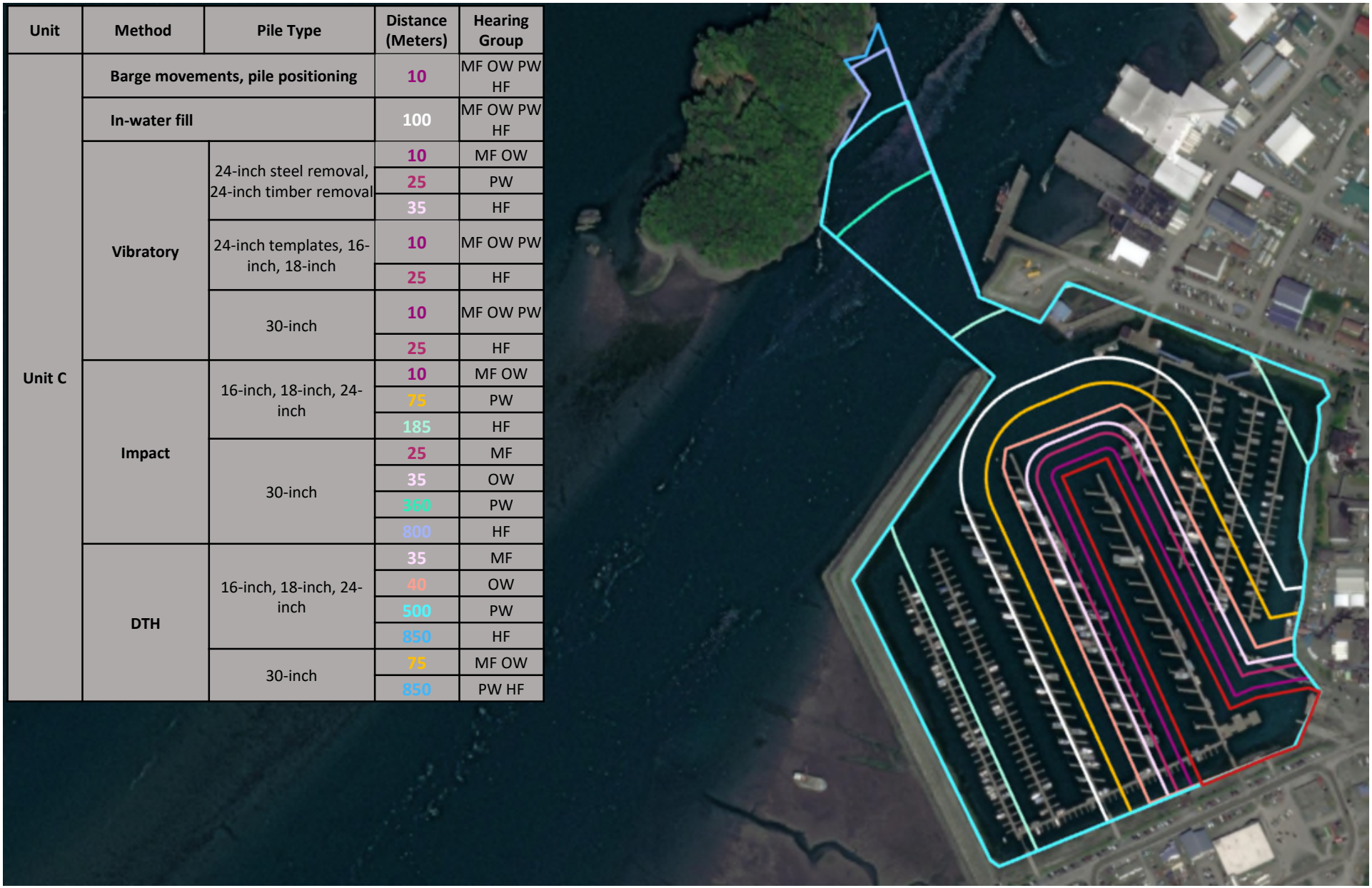
Cordova Harbor Rebuild Project Distances to Level A Shutdown Zones: Unit B

Unit	Method	Pile Type	Distance (Meters)	Hearing Group
Unit B	Barge movements, pile positioning		10	MF OW PW HF
	Vibratory	24-inch steel removal, 24-inch timber removal	10	OW MF
			25	PW
			35	HF
		24-inch templates, 16-inch, 18-inch	10	OW PW MF
			25	HF
		30-inch	10	MF OW PW
			25	HF
	Impact	16-inch, 18-inch	10	MF OW
			75	PW
			185	HF
		30-inch	25	MF
			35	OW
			360	PW
			800	HF
	DTH	16-inch, 18-inch	35	MF
			40	OW
			500	PW
			1,080	HF
		30-inch	75	MF OW
			925	PW
			2,050	HF



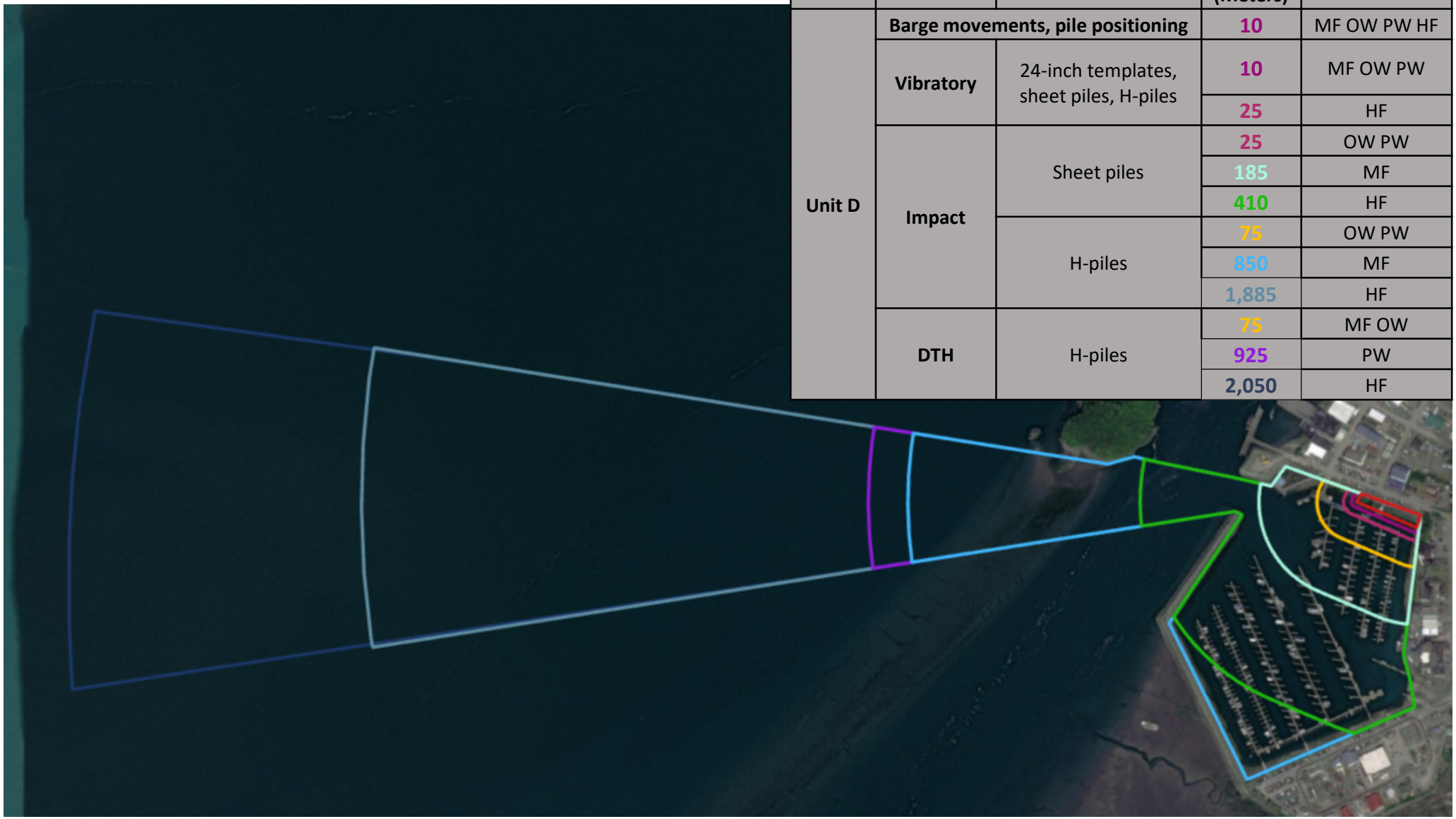
Cordova Harbor Rebuild Project Distances to Level A Shutdown Zones: Unit C

Unit	Method	Pile Type	Distance (Meters)	Hearing Group
Unit C	Barge movements, pile positioning		10	MF OW PW HF
	In-water fill		100	MF OW PW HF
	Vibratory	24-inch steel removal, 24-inch timber removal	10	MF OW
			25	PW
			35	HF
		24-inch templates, 16-inch, 18-inch	10	MF OW PW
			25	HF
		30-inch	10	MF OW PW
			25	HF
	Impact	16-inch, 18-inch, 24-inch	10	MF OW
			75	PW
			185	HF
		30-inch	25	MF
			35	OW
			360	PW
			800	HF
	DTH	16-inch, 18-inch, 24-inch	35	MF
			40	OW
			500	PW
			850	HF
		30-inch	75	MF OW
			850	PW HF



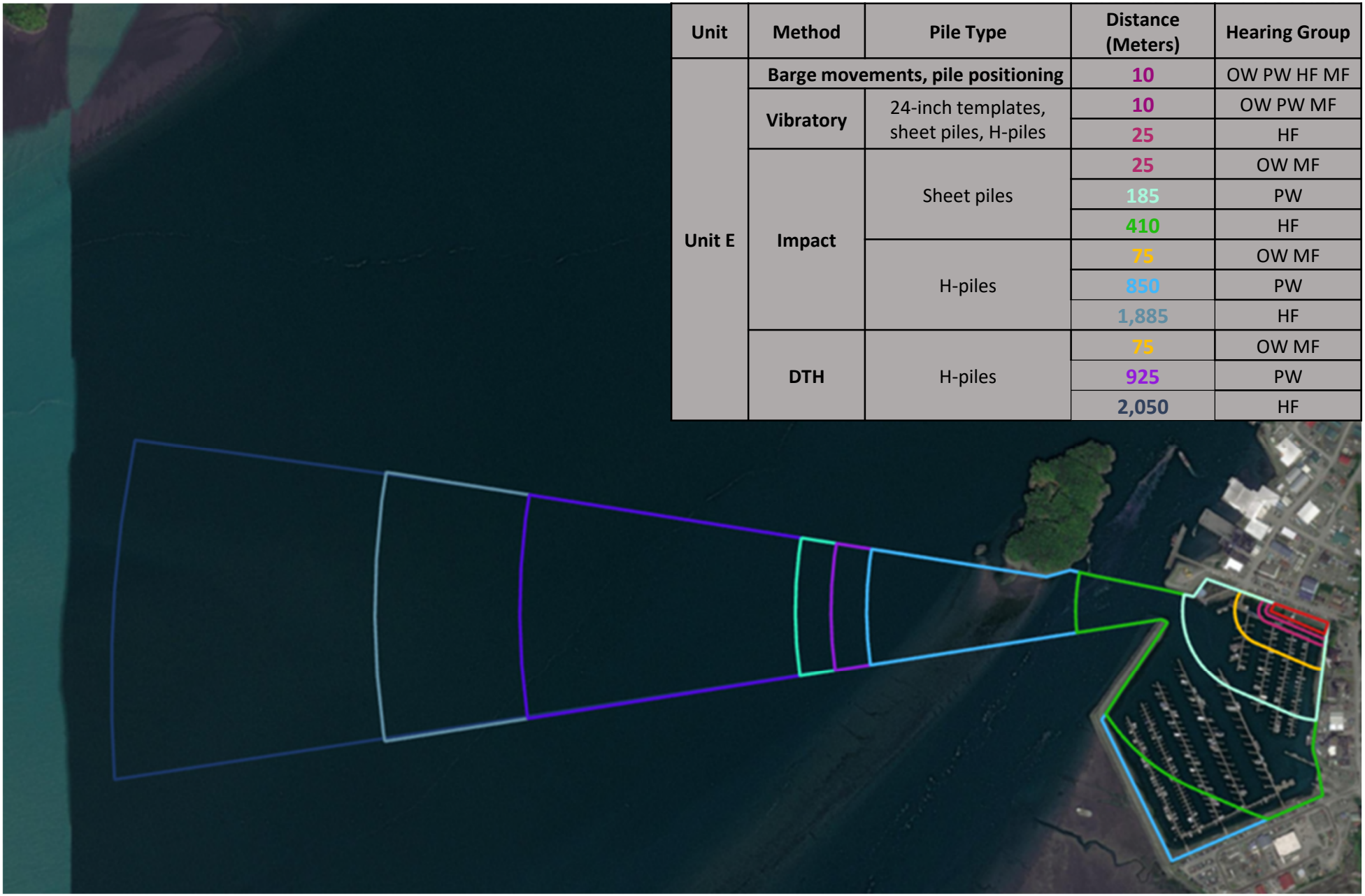
Cordova Harbor Rebuild Project Distances to Level A Shutdown Zones: Unit D

Unit	Method	Pile Type	Distance (Meters)	Hearing Group
Unit D	**Barge movements, pile positioning**		10	MF OW PW HF
	Vibratory	24-inch templates, sheet piles, H-piles	10	MF OW PW
			25	HF
	Impact	Sheet piles	25	OW PW
			185	MF
			410	HF
		H-piles	75	OW PW
			850	MF
			1,885	HF
	DTH	H-piles	75	MF OW
			925	PW
			2,050	HF



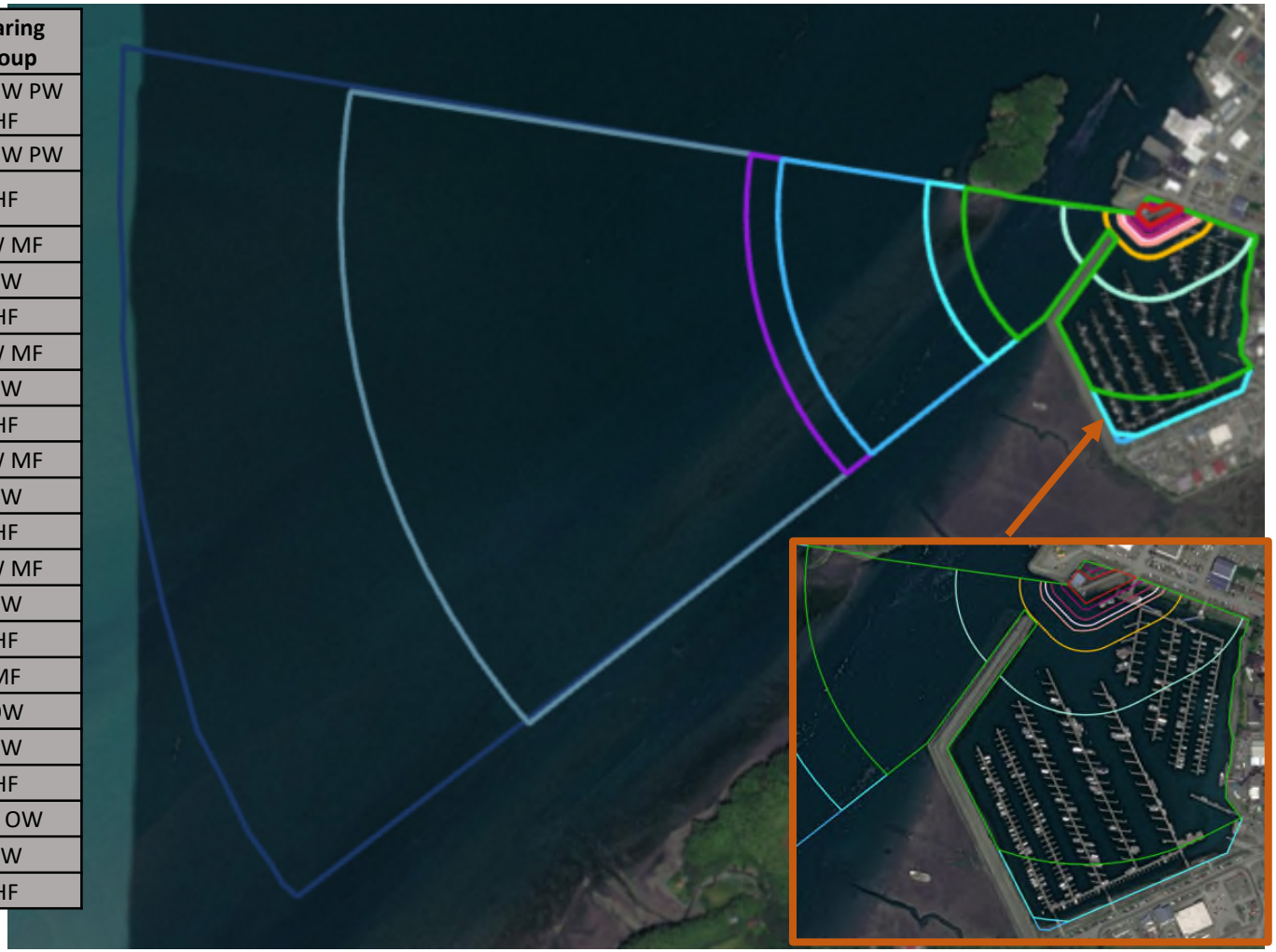
Cordova Harbor Rebuild Project Distances to Level A Shutdown Zones: Unit E

Unit	Method	Pile Type	Distance (Meters)	Hearing Group
Unit E	Barge movements, pile positioning		10	OW PW HF MF
	Vibratory	24-inch templates, sheet piles, H-piles	10	OW PW MF
			25	HF
	Impact	Sheet piles	25	OW MF
			185	PW
			410	HF
		H-piles	75	OW MF
			850	PW
			1,885	HF
	DTH	H-piles	75	OW MF
			925	PW
			2,050	HF



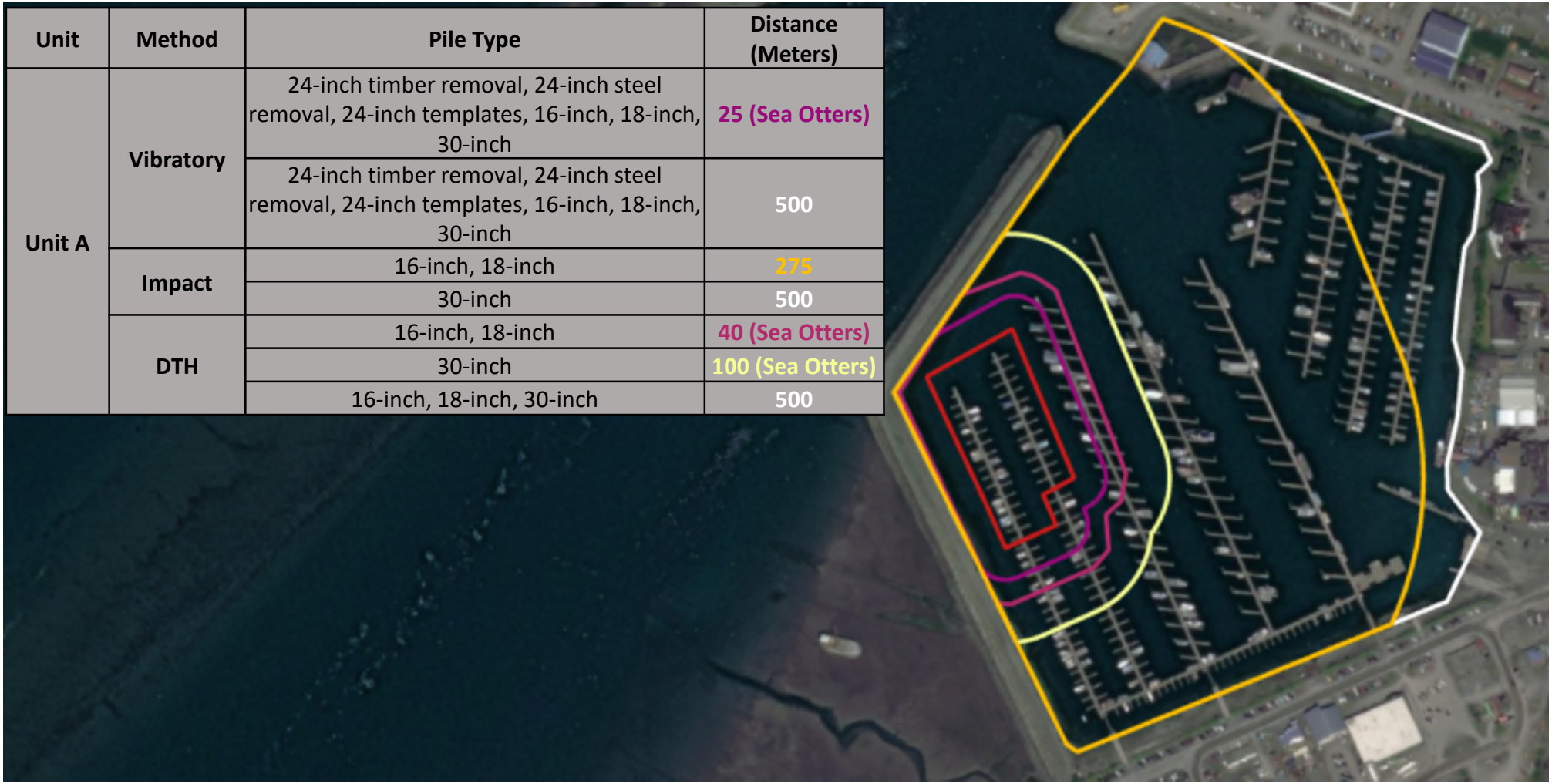
Cordova Harbor Rebuild Project Distances to Level A Shutdown Zones: Unit F

Unit	Method	Pile Type	Distance (Meters)	Hearing Group
Unit F	**Barge movements, pile positioning, dredging**		10	MF OW PW HF
	Vibratory	24-inch templates, 24-inch, H, and sheet piles	10	MF OW PW
			25	HF
		24-inch timber removal	10	OW MF
			25	PW
			35	HF
	Impact	24-inch	10	OW MF
			75	PW
			185	HF
		Sheet piles	25	OW MF
			185	PW
			410	HF
		H-piles	75	OW MF
			850	PW
			1,885	HF
	DTH	24-inch	35	MF
			40	OW
			500	PW
			1080	HF
		H-piles	75	MF OW
			925	PW
			2,050	HF



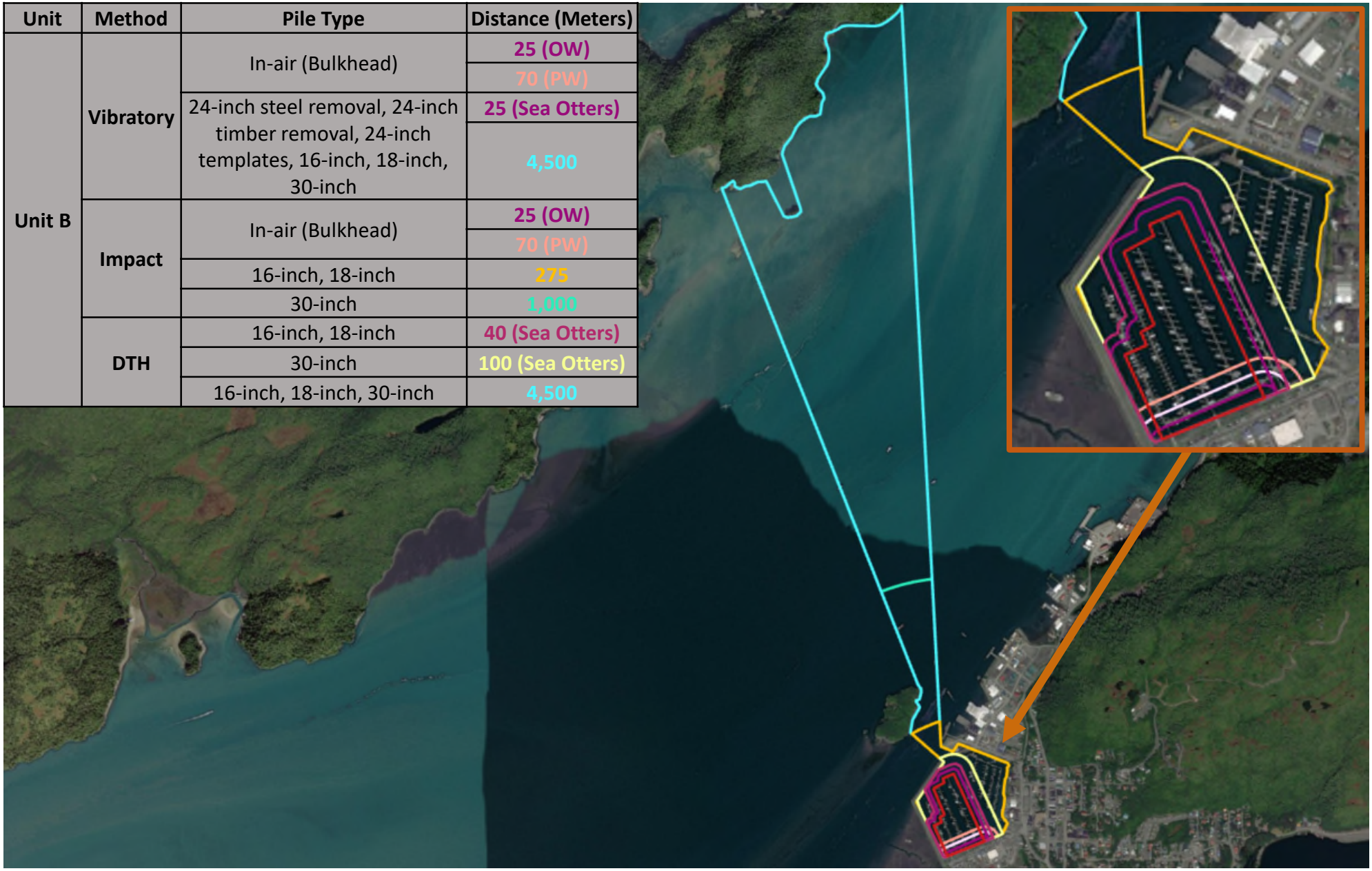
Cordova Harbor Rebuild Project Distances to Level B Monitoring and Shutdown Zones: Unit A

Unit	Method	Pile Type	Distance (Meters)
Unit A	Vibratory	24-inch timber removal, 24-inch steel removal, 24-inch templates, 16-inch, 18-inch, 30-inch	25 (Sea Otters)
		24-inch timber removal, 24-inch steel removal, 24-inch templates, 16-inch, 18-inch, 30-inch	500
	Impact	16-inch, 18-inch	275
		30-inch	500
	DTH	16-inch, 18-inch	40 (Sea Otters)
		30-inch	100 (Sea Otters)
		16-inch, 18-inch, 30-inch	500



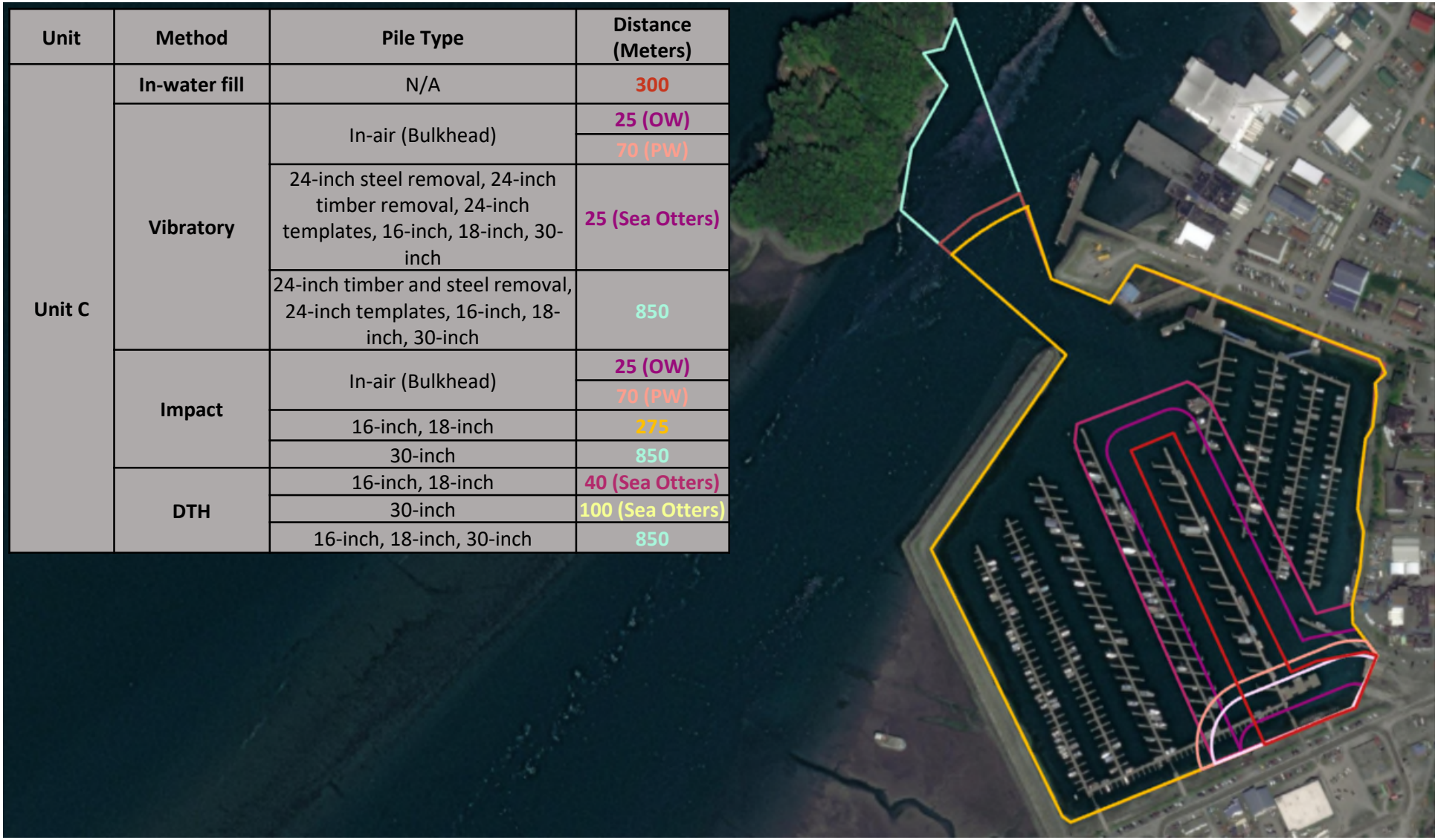
Cordova Harbor Rebuild Project Distances to Level B Monitoring and Shutdown Zones: Unit B

Unit	Method	Pile Type	Distance (Meters)
Unit B	Vibratory	In-air (Bulkhead)	25 (OW)
			70 (PW)
		24-inch steel removal, 24-inch timber removal, 24-inch templates, 16-inch, 18-inch, 30-inch	25 (Sea Otters)
			4,500
	Impact	In-air (Bulkhead)	25 (OW)
			70 (PW)
		16-inch, 18-inch	275
		30-inch	1,000
	DTH	16-inch, 18-inch	40 (Sea Otters)
		30-inch	100 (Sea Otters)
		16-inch, 18-inch, 30-inch	4,500



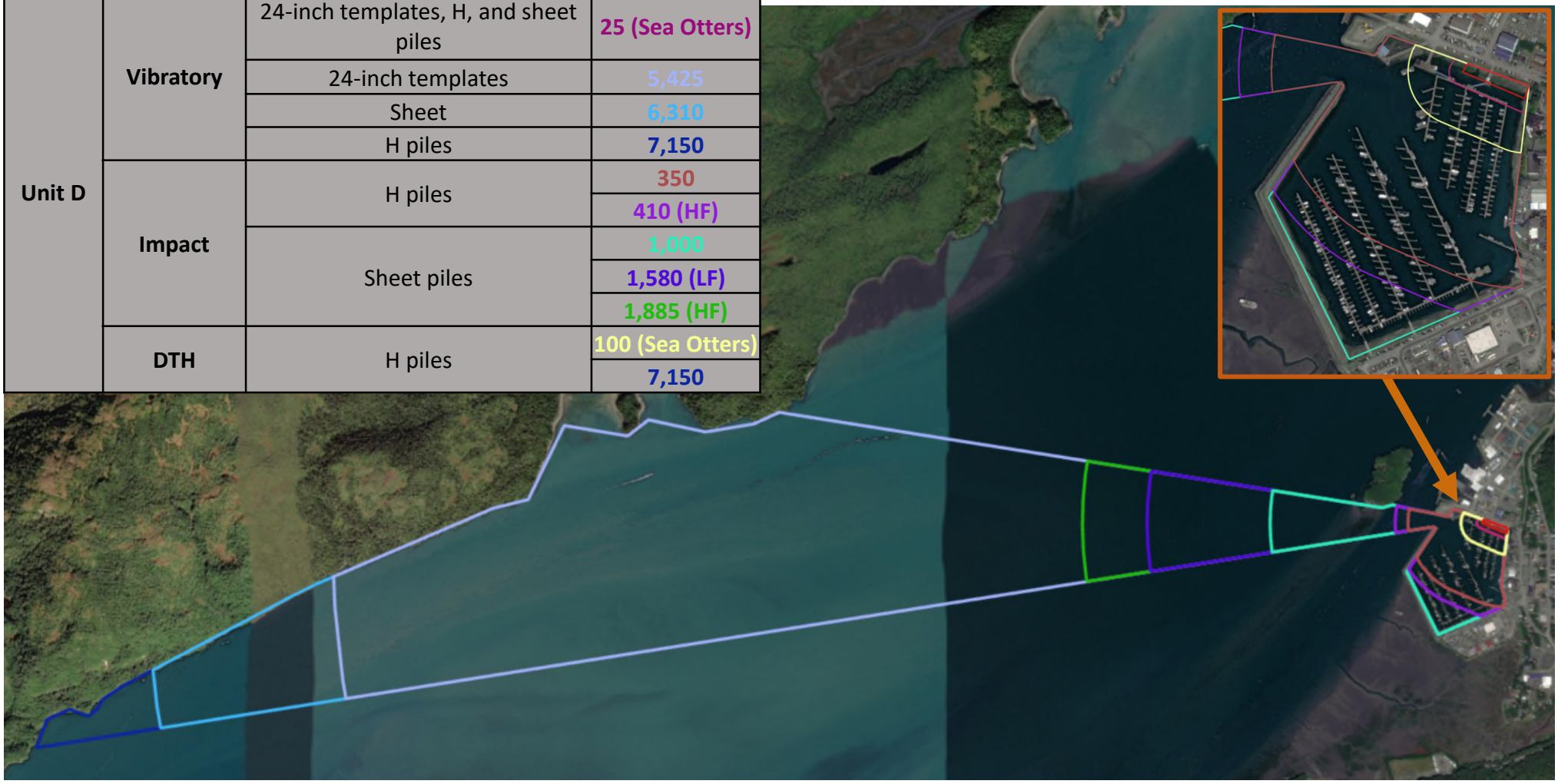
Cordova Harbor Rebuild Project Distances to Level B Monitoring and Shutdown Zones: Unit C

Unit	Method	Pile Type	Distance (Meters)
Unit C	In-water fill	N/A	300
	Vibratory	In-air (Bulkhead)	25 (OW)
			70 (PW)
		24-inch steel removal, 24-inch timber removal, 24-inch templates, 16-inch, 18-inch, 30-inch	25 (Sea Otters)
		24-inch timber and steel removal, 24-inch templates, 16-inch, 18-inch, 30-inch	850
	Impact	In-air (Bulkhead)	25 (OW)
			70 (PW)
		16-inch, 18-inch	275
		30-inch	850
	DTH	16-inch, 18-inch	40 (Sea Otters)
		30-inch	100 (Sea Otters)
		16-inch, 18-inch, 30-inch	850



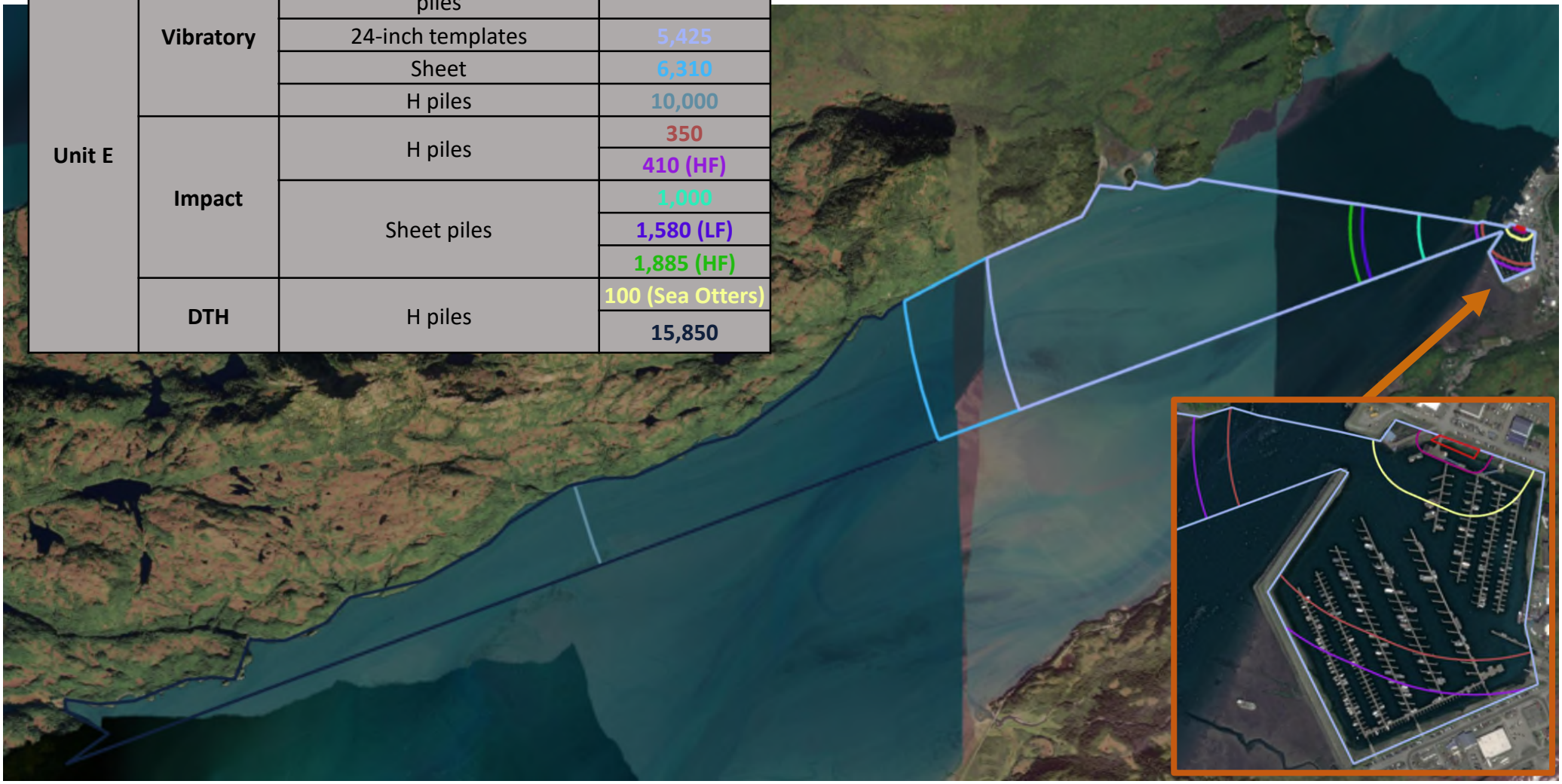
Cordova Harbor Rebuild Project Distances to Level B Monitoring and Shutdown Zones: Unit D

Unit	Method	Pile Type	Distance (Meters)
Unit D	Vibratory	24-inch templates, H, and sheet piles	25 (Sea Otters)
		24-inch templates	5,425
		Sheet	6,310
		H piles	7,150
	Impact	H piles	350
			410 (HF)
		Sheet piles	1,000
			1,580 (LF)
			1,885 (HF)
	DTH	H piles	100 (Sea Otters)
			7,150



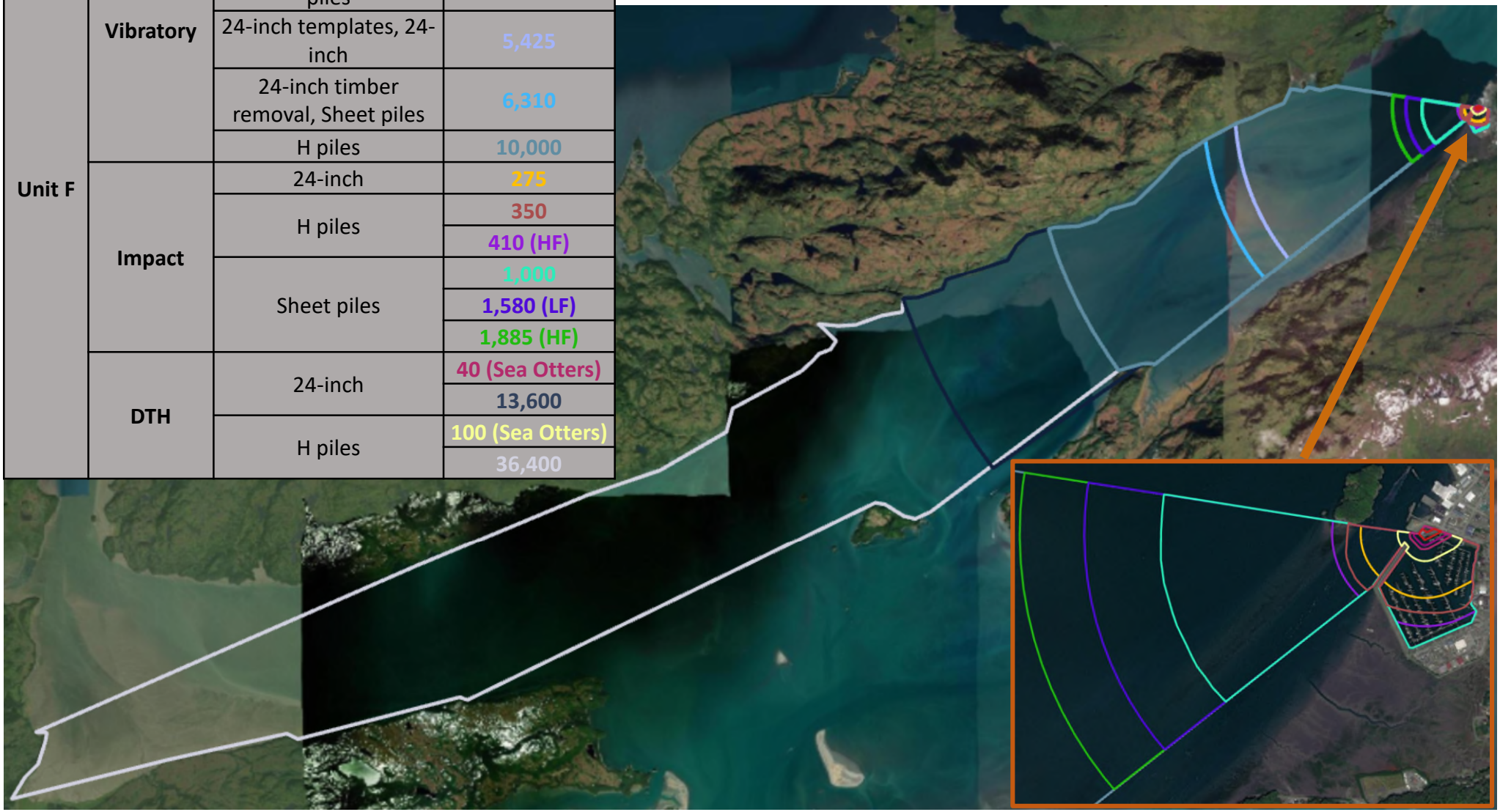
Cordova Harbor Rebuild Project Distances to Level B Monitoring and Shutdown Zones: Unit E

Unit	Method	Pile Type	Distance (Meters)
Unit E	Vibratory	24-inch templates, H, and sheet piles	25 (Sea Otters)
		24-inch templates	5,425
		Sheet	6,310
		H piles	10,000
	Impact	H piles	350
			410 (HF)
		Sheet piles	1,000
			1,580 (LF)
			1,885 (HF)
	DTH	H piles	100 (Sea Otters)
			15,850



Cordova Harbor Rebuild Project Distances to Level B Monitoring and Shutdown Zones: Unit F

Unit	Method	Pile Type	Distance (Meters)
Unit F	Vibratory	24-inch templates, 24-inch timber removal, 24-inch, H, and sheet piles	25 (Sea Otters)
		24-inch templates, 24-inch	5,425
		24-inch timber removal, Sheet piles	6,310
		H piles	10,000
	Impact	24-inch	275
		H piles	350
			410 (HF)
		Sheet piles	1,000
			1,580 (LF)
			1,885 (HF)
	DTH	24-inch	40 (Sea Otters)
			13,600
		H piles	100 (Sea Otters)
			36,400



Appendix C: Construction Activity and Communication Log

Construction Activity and Communication Log

Project:_____ Location: _____ Observer(s): _____ Date:_____

Time	Pile Size	Pile Type	Construction Type	Obs.	Construction Personnel	Communication/Comments

Filling Out Construction Activity and Communication Logs	
Data Columns	**Definition and How to Record**
General Information *(top of form)*	
Project	Time that monitoring by MMOs/PSOs began and ended, without interruption (military time)
Project Name	Whittier Head of the Bay Cruise Ship Dock
Monitoring Location	See 4MP
Observer	Names of Observers at each location
Date	MM/DD/YYYY
Construction and Communication Activities	
Time of event	Time that construction activities and all communications between MMOs/PSOs and construction crews take place
Type of construction activity	Type of construction activity occurring, including ramp up, startup, shutdown, type of pile installation technique, pile size, and pile type (permanent or temporary)
Communication	Information communicated between MMOs/PSOs and construction crew

Appendix D: Marine Mammal Sighting Form

MARINE MAMMAL OBSERVATION RECORD

Project Name: ____________________

Monitoring Location: ____________________

Date: ____________________

Time Effort Initiated: ____________________

Time Effort Completed: ____________________

Page ________ of ________

Time	Visibility	Glare	Weather Condition	Wave Height	BSS	Wind	Swell
:	B – P – M – G – E	%	S – PC – L – R – F – OC – SN – HR	Lt/Mod/Hvy		N S E W	N S E W
:	B – P – M – G – E	%	S – PC – L – R – F – OC – SN – HR	Lt/Mod/Hvy		N S E W	N S E W
:	B – P – M – G – E	%	S – PC – L – R – F – OC – SN – HR	Lt/Mod/Hvy		N S E W	N S E W
:	B – P – M – G – E	%	S – PC – L – R – F – OC – SN – HR	Lt/Mod/Hvy		N S E W	N S E W
:	B – P – M – G – E	%	S – PC – L – R – F – OC – SN – HR	Lt/Mod/Hvy		N S E W	N S E W
:	B – P – M – G – E	%	S – PC – L – R – F – OC – SN – HR	Lt/Mod/Hvy		N S E W	N S E W

Event Code	Sight # (1 or 1.1 if re-sight)	Time/Dur (Start/End time if cont.)	WP/ Grid #/ DIR of travel	Zone/ Radius/ Impact Pile #?	Obs.	Sighting Cue	Species	Group Size	Behavior Code (see code sheet)	Construction Type	Mitigation Type	Exposure (Y/N)	Behavior Change/ Response to Activity/Comments/Human Activity/Vessel Hull # or Name/ Visibility Notes
E ON PRE/POST CON S M OR E OFF		: :	______ Grid N or S W or E			BL BO BR DF SA OTHER		Min: Max: Best:		DD JT FL V I OWC NOWC NONE	DE SD None		
E ON PRE/POST CON S M OR E OFF		: :	______ Grid N or S W or E			BL BO BR DF SA OTHER		Min: Max: Best:		DD JT FL V I OWC NOWC NONE	DE SD None		
E ON PRE/POST CON S M OR E OFF		: :	______ Grid N or S W or E			BL BO BR DF SA OTHER		Min: Max: Best:		DD JT FL V I OWC NOWC NONE	DE SD None		
E ON PRE/POST CON S M OR E OFF		: :	______ Grid N or S W or E			BL BO BR DF SA OTHER		Min: Max: Best:		DD JT FL V I OWC NOWC NONE	DE SD None		
E ON PRE/POST CON S M OR E OFF		: :	______ Grid N or S W or E			BL BO BR DF SA OTHER		Min: Max: Best:		DD JT FL V I OWC NOWC NONE	DE SD None		
E ON PRE/POST CON S M OR E OFF		: :	______ Grid N or S W or E			BL BO BR DF SA OTHER		Min: Max: Best:		DD JT FL V I OWC NOWC NONE	DE SD None		
E ON PRE/POST CON S M OR E OFF		: :	______ Grid N or S W or E			BL BO BR DF SA OTHER		Min: Max: Best:		DD JT FL V I OWC NOWC NONE	DE SD None		
E ON PRE/POST CON S M OR E OFF		: :	______ Grid N or S W or E			BL BO BR DF SA OTHER		Min: Max: Best:		DD JT FL V I OWC NOWC NONE	DE SD None		

Marine Mammal Observation Record – Sighting Codes

Behavior Codes

Code	Behavior	Definition
BR	Breaching	Leaps clear of water
CD	Change Direction	Suddenly changes direction of travel
CH	Chuff	Makes loud, forceful exhalation of air at surface
DI	Dive	Forward dives below surface
DE	Dead	Shows decomposition or is confirmed as dead by investigation
DS	Disorientation	An individual displaying multiple behaviors that have no clear direction or purpose
FI	Fight	Agonistic interactions between two or more individuals
FO	Foraging	Confirmed by food seen in mouth
MI	Milling	Moving slowly at surface, changing direction often, not moving in any particular direction
PL	Play	Behavior that does not seem to be directed towards a particular goal; may involve one, two or more individuals
PO	Porpoising	Moving rapidly with body breaking surface of water
SL	Slap	Vigorously slaps surface of water with body, flippers, tail etc.
SP	Spyhopping	Rises vertically in the water to "look" above the water
SW	Swimming	General progress in a direction. Note general direction of travel when last seen [Example: "SW (N)" for swimming north]
TR	Traveling	Traveling in an obvious direction. Note direction of travel when last seen [Example: "TR (N)" for traveling north]
UN	Unknown	Behavior of animal undetermined, does not fit into another behavior
AWA	Approach Work	
LWA	Leave Work Area	
Pinniped only		
EW	Enter Water (from haul out)	Enters water from a haul-out for no obvious reason
FL	Flush (from haul out)	Enters water in response to disturbance
HO	Haul out (from water)	Hauls out on land
RE	Resting	Resting onshore or on surface of water
LO	Look	Is upright in water "looking" in several directions or at a single focus
SI	Sink	Sinks out of sight below surface without obvious effort (usually from an upright position)
VO	Vocalizing	Animal emits barks, squeals, etc.
Cetacean only		
LG	Logging	Resting on surface of water with no obvious signs of movement

Sea State and Wave Height: Use Beaufort Sea State Scale for Sea State. This refers to the surface layer and whether it is glassy in appearance or full of white caps. In the open ocean, it also considers the wave height or swell, but in inland waters the wave height (swells) may never reach the levels that correspond to the correct surface white cap number. Therefore, include wave height for clarity.

Glare: Percent glare should be the total glare of observers' area of responsibility. Determine if observer coverage is covering 90 degrees or 180 degrees and document daily. Then assess total glare for that area. This will provide needed information on what percentage of the field of view was poor due to glare.

Swell Direction: Swell direction should be where the swell is coming from (S for coming from the south). If possible, record direction relative to fixed location (pier). Choose this location at beginning of monitoring project.

Wind Direction: Wind direction should also be where the wind is coming from.

Filling Out Sighting Forms	
Data Columns	**Definition and How to Record Data**
General Information *(Top of Form)*	
Project Name	Whittier Head of the Bay Cruise Ship Dock
Monitoring Location	See 4MP
Date	MM/DD/YYYY
Time effort initiated and completed	Time started pre-watch and time post-watch ended (military time). If there is more than one monitoring period in a day, start a new form for each period.
Environmental Conditions	
Environmental Conditions	Record at the start of monitoring period, when changes, and at the end of monitoring period.
Visibility	B-bad, P-poor, M-moderate, G-good, and E-excellent
Glare	Amount of water obstructed by glare (0–100%) and direction of glare (from south, north, or another direction)
Weather conditions	Dominant weather conditions: sunny (S), partly cloudy (PC), light rain (LR), steady rain (R), fog (F), overcast (OC), light snow (LS), snow (SN)
Wave Height	Lt-light, Mod-moderate, Hvy-heavy
Wind and Swell direction	From the north (N), northeast (NE), east (E), southeast (SE), south (S), southwest (SW), west (W), northwest (NW)
Beaufort Sea State	Scale 1-12. See BSS sheet.
Sightings	
Event Code	Indicates what events are happening at the time of the sighting, what events may have occurred due to the sighting, and observer rotations.
Time/Duration	Time first sighted and time of last sighting (military time).
Sighting Number	Chronological (1,2,3, etc.) If the same marine mammal is resighted at a distance greater than 25 meters from the original sighting location record as a resight (Ex. 1.1- same marine mammal as sighting 1, but sighted for a second time in different location)
WP/Grid #/DIR of Travel	Grid number that marine mammal was sighted in and direction of travel. Format should be ***grid map letter-grid*** (Example: If a marine mammal is sighted in grid **2B** on **Grid Map B** this should be denoted by **B-2B**).
Distance from pile	Distance in meters from in-water work

Observer (Obs.)	Initials of the Observer who sighted the marine mammal or who is coming on shift during a rotation
Sighting Cue	How was the marine mammal sighted
Species	Appropriate species abbreviation from code sheet
Group Size	Record the minimum and maximum number of individuals that were sighted. Then determine and record the best number of individuals.
Behavior	Behaviors observed using appropriate abbreviations from code sheet
Construction Type	Circle construction type that is actively occurring at the time and for the duration of the sighting.
Mitigation Type	Circle mitigation type, if any. Based upon monitoring and shutdown zones does a delay of work (pre-watch and post-watch) or a shutdown (monitoring period) need to occur.
Exposure	If a marine mammal enters its Level A or Level B distance and work is actively occurring it will be an exposure indicate yes (Y). If no work is actively occurring indicate no (N)

Event

Code	Activity Type
E ON	Effort On
E OFF	Effort Off
PRE	Pre-Construction Watch
POST	Post-Construction Watch
CON	Construction (see types)
S	Sighting
M	Mitigation
OR	Observer Rotation

Sighting Cues

Code	Distance Visible
BL	Blow
BO	Body
BR	Breach
DF	Dorsal Fin
SA	Surface Activity
OTHR	Other

Marine Mammal Species

Code	Marine Mammal Species
HPBK	Humpback Whale
DAPO	Dall's Porpoise
ORCA	Killer Whale
HSEA	Harbor Seal
STSL	Steller Sea Lion
SO	Sea Otter

Construction Type

Code	Activity Type
OWC	Over-Water Construction
NOWC	No Over-Water Construction
V	Vibratory Hammer
I	Impact Hammer
DR	Drilling
NONE	No Construction

Mitigation Codes

Code	Activity Type
DE	Delay onset of In-Water Work
SD	Shutdown In-Water Work

Visibility

Code	Distance Visible
B	Bad (<0.5km)
P	Poor (0.5-0.9km)
M	Moderate (0.9-3km)
G	Good (3-10km)
E	Excellent (>10km)

Weather Conditions

Code	Weather Condition
S	Sunny
PC	Partly Cloudy
L	Light Rain
R	Steady Rain
F	FOG
OC	Overcast
SN	Snow
HR	Heavy Rain

Wave Height

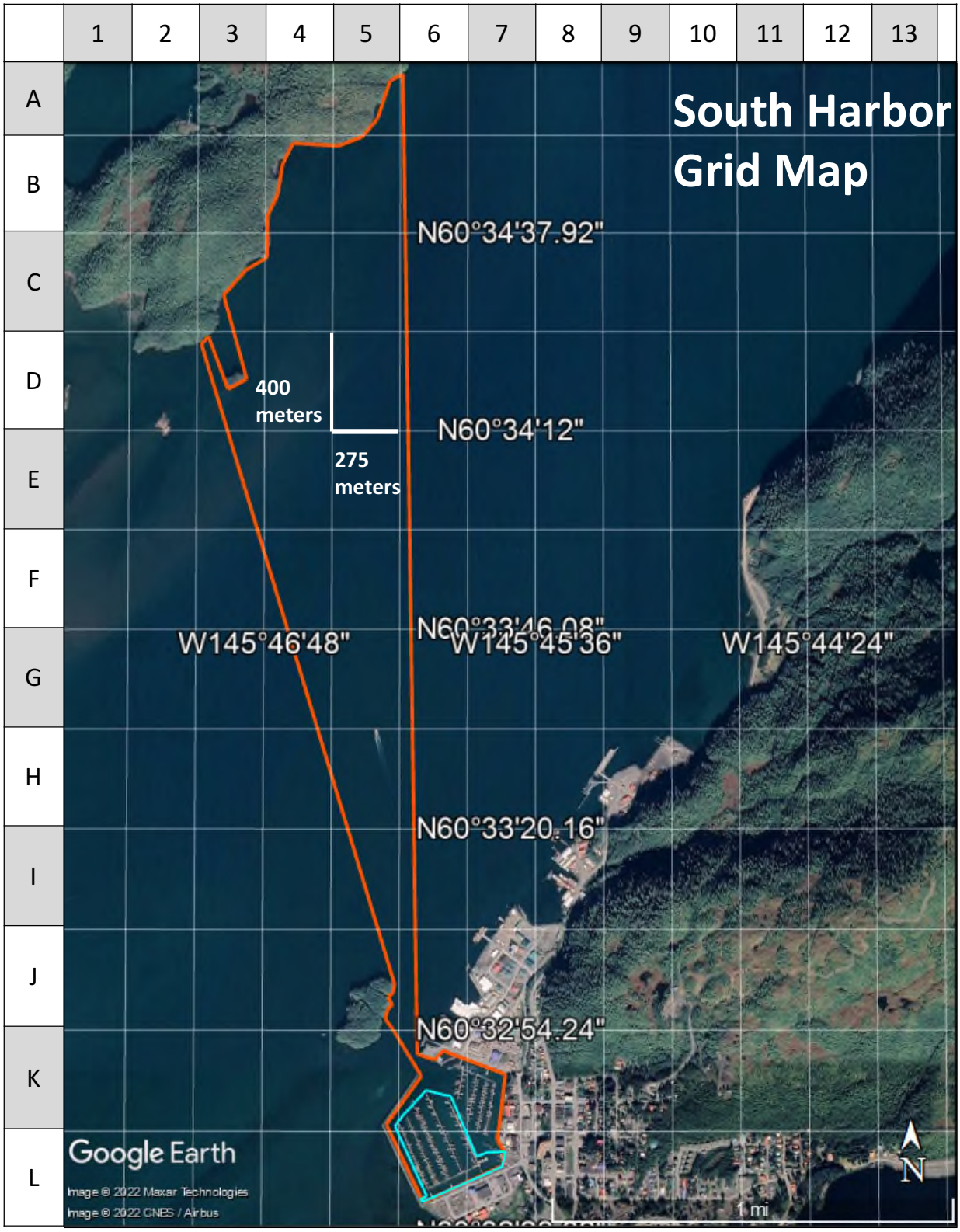
Code	Wave Height
Light	0-3 ft
Moderate	4-6 ft
Heavy	>6 ft

Estimating Wind Speed and Sea State with Visual Clues

Beaufort number	Wind Description	Wind Speed	Wave Height	Visual Clues
0	Calm	0 knots	0 feet	Sea is like a mirror. Smoke rises vertically.
1	Light Air	1-3 kts	< 1/2	Ripples with the appearance of scales are formed, but without foam crests. Smoke drifts from funnel.
2	Light breeze	4-6 kts	1/2 ft (max 1)	Small wavelets, still short but more pronounced, crests have glassy appearance and do not break. Wind felt on face. Smoke rises at about 80 degrees.
3	Gentle Breeze	7-10 kts	2 ft (max 3)	Large wavelets, crests begin to break. Foam of glassy appearance. Perhaps scattered white horses (white caps). Wind extends light flag and pennants. Smoke rises at about 70 deg.
4	Moderate Breeze	11-16 kts	3 ft (max 5)	Small waves, becoming longer. Fairly frequent white horses (white caps). Wind raises dust and loose paper on deck. Smoke rises at about 50 deg. No noticeable sound in the rigging. Slack halyards curve and sway. Heavy flag flaps limply.
5	Fresh Breeze	17-21kts	6 ft (max 8)	Moderate waves, taking more pronounced long form. Many white horses (white caps) are formed (chance of some spray). Wind felt strongly on face. Smoke rises at about 30 deg. Slack halyards whip while bending continuously to leeward. Taut halyards maintain slightly bent position. Low whistle in the rigging. Heavy flag doesn't extended but flaps over entire length.
6	Strong Breeze	22-27 kts	9 ft (max 12)	Large waves begin to form. White foam crests are more extensive everywhere (probably some spray). Wind stings face in temperatures below 35 deg F (2C). Slight effort in maintaining balance against wind. Smoke rises at about 15 deg. Both slack and taut halyards whip slightly in bent position. Low moaning, rather than whistle, in the rigging. Heavy flag extends and flaps more vigorous.
7	Near Gale	28-33 kts	13 ft (max 19)	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of wind. Necessary to lean slightly into the wind to maintain balance. Smoke rises at about 5 to 10 deg. Higher pitched moaning and whistling heard from rigging. Halyards still whip slightly. Heavy flag extends fully and flaps only at the end. Oilskins and loose clothing inflate and pull against the body.
8	Gale	34-40 kts	18 ft (max 25)	Moderately high waves of greater length. Edges of crests begin to break into the spindrift. The foam is blown in well-marked streaks along the direction of the wind. Head pushed back by the force of the wind if allowed to relax. Oilskins and loose clothing inflate and pull strongly. Halyards rigidly bent. Loud whistle from rigging. Heavy flag straight out and whipping.
9	Strong Gale	41-47 kts	23 ft (max 32)	High waves. Dense streaks of foam along direction of wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility.
10	Storm	48-55 kts	29 ft (max 41)	Very high waves with long overhanging crests. The resulting foam, in great patches is blown in dense streaks along the direction of the wind. On the whole, the sea takes on a whitish appearance. Tumbling of the sea becomes heavy and shock-like. Visibility affected.
11	Violent Storm	56-63 kts	37 ft (max 52)	Exceptionally high waves (small and medium-sized ships might be for time lost to view behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere, the edges of the wave crests are blown into froth. Visibility greatly affected.
12	Hurricane	64+ kts	45+ ft	The air is filled with foam and spray. The sea is completely white with driving spray. Visibility is seriously affected.

Appendix E: Grid Maps

Cordova Harbor Rebuild Project South Harbor Grid Map



Cordova Harbor Rebuild Project North Harbor Grid Map