Issuance of an Incidental Harassment Authorization for the Take of Marine Mammals Incidental to the Port of Alaska's North Extension Stabilization Step 1 Project in Anchorage, Alaska

LEAD AGENCY:	U.S. Department of Commerce National Oceanic and Atmospheric Administration National Marine Fisheries Service
RESPONSIBLE OFFICIAL:	Kimberly Damon-Randall, Director Office of Protected Resources National Marine Fisheries Service
FOR FURTHER INFORMATION:	Reny Tyson Moore National Marine Fisheries Service Office of Protected Resources Permits and Conservation 1315 East West Highway Silver Spring, MD 20910 301-427-8481
LOCATION:	Anchorage, Alaska
ABSTRACT:	This Environmental Assessment analyzes the environmental impacts of the National Marine Fisheries Service, Office of Protected Resources' decision regarding issuance of an Incidental Harassment Authorization, pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act, to the Port of Alaska for the take of small numbers of marine mammals incidental to construction of the North Extension Stabilization Step 1 Project for the Port of Alaska Modernization Program in Anchorage, Alaska.
DATE:	January 2024

This page intentionally left blank.

Contents

TABLES

FIGURES

Acronyms and Abbreviations

°C	degrees Celsius
ADF&G	Alaska Department of Fish & Game
AKRO	Alaska Regional Office
ANHSC	Alaska Native Harbor Seal Commission
BA	Biological Assessment
BiOp	Biological Opinion
CALTRANS	California Department of Transportation
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	centimeter(s)
CM	Companion Manual
CPOA	closest point of approach
CTR	Cargo Terminals Replacement
CV	coefficient of variation
CY	cubic yard(s)
dB	decibels
dB re 1 µPa	decibels referenced to 1 micropascal
DOR	designer of record
DOT&PF	Department of Transportation and Public Facilities
DPS	Distinct Population Segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRN	*Federal Register* Notice
ft	foot/feet
G&G	geophysical and geotechnical
H:V	horizontal to vertical ratio
HF	high frequency
hr	hour(s)
Hz	hertz
IHA	Incidental Harassment Authorization
in	inch(es)
ITA	Incidental Take Authorization
ITS	Incidental Take Statement
JBER	Joint Base Elmendorf Richardson
KABATA	Knik Arm Bridge and Toll Authority

kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
$L_{pk,flat}$	peak sound pressure level (unweighted)
$L_{E,24h}$	sound exposure level, cumulative 24 hours
LF	low frequency
LOA	Letter of Authorization
LOC	Letter of Concurrence
m	meter(s)
MF	mid-frequency
mi	mile
MHHW	mean higher high water
MLLW	mean lower low water
MMPA	Marine Mammal Protection Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MTRP	Marine Terminal Redevelopment Project
nmi	nautical mile(s)
NA	not applicable
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NES	North Extension Stabilization
NES1	North Extension Stabilization Step 1
NES2	North Extension Stabilization Step 2
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
OCSP	Open Cell Sheet Pile
OPR	Office of Protected Resources
OSP	Optimum Sustainable Population
OW	otariid in water
PAMP	Port of Alaska Modernization Program
PCT	Petroleum and Cement Terminal
POA	Port of Alaska
POL	Petroleum Oil Lubricants
PSO	Protected Species Observers
PTS	permanent threshold shift
PW	phocid in water
RMS	root mean square
SAR	Stock Assessment Report
SEL	sound exposure level
SEL_{cum}	cumulative sound exposure levels
SFA	Sustainable Fisheries Act

SFD	South Floating Dock
SPL	sound pressure level
SSL	sound source level
T&E	threatened and endangered
TL	transmission loss
TPP	Test Pile Program
TTS	temporary threshold shift
UME	Unusual Mortality Event
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USFWS	U.S. Fish and Wildlife Service

Chapter 1 Introduction and Purpose and Need

1.1 Introduction and Background

On 19 July 2022, the National Marine Fisheries Service (NMFS) received an initial application from the Port of Alaska (POA) requesting authorization to take[1] small numbers of marine mammals, by Level A and Level B harassment, incidental to construction of the North Extension Stabilization (NES) Step-1 (NES1) Project near its existing port facility in Anchorage located in Knik Arm in upper Cook Inlet, Alaska (POA 2022a). NMFS received revised applications from the POA on 27 December 2022, 28 July 2023, and 31 August 2023. NMFS deemed the application adequate and complete on 07 September 2023.The POA submitted a final version addressing additional minor corrections on September 21, 2023.

NMFS is required to review applications and, if appropriate, issue Incidental Take Authorizations (ITAs) pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 United States [U.S.] Code [U.S.C.] 1361 et seq.). An authorization for incidental take of marine mammals shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). NMFS evaluated the POA's request, and propose to make the required findings under the MMPA, and proposes to determine that issuing an Incidental Harassment Authorization (IHA) would be appropriate. NMFS criteria for determining whether to grant or deny an applicant's request are explained in this chapter, and detailed information is available at https://www.fisheries.noaa.gov/topic/laws-policies/marine-mammal-protection-act.

The National Environmental Policy Act (NEPA), 42 U.S.C. 4321 et seq (2023), the 2020 Council on Environmental Quality (CEQ) Regulations as modified by the Phase I 2022 revisions (40 Code of Federal Regulations [CFR] 1500–1508 (2022))[2], and National Oceanic and Atmospheric and Administration (NOAA) policy and procedures[3] each requires all proposals for major federal actions to be reviewed with respect to environmental consequences on the human environment. NMFS' consideration of whether to issue an IHA to the POA allowing take of marine mammals, consistent with provisions under the MMPA and incidental to the applicant's lawful activities, is a major federal action. NMFS determined that an Environmental Assessment (EA) was the appropriate level of NEPA analysis for this action.

This chapter presents a summary of NMFS' authority to authorize incidental take of marine mammals, provides a summary of the POA's request, and identifies NMFS' Proposed Action and purpose and need. This chapter also explains the background and environmental review process associated with the POA's request and provides other information relevant to the analysis in this EA, such as the scope of the analysis and compliance with environmental laws and regulations. The remainder of this EA is organized as follows:

[1] The term "take" means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. 1362(3)(13)).

[2]This EA is being prepared using the 2020 CEQ NEPA regulations as modified by the CEQ's Phase 1 2022 revisions. 87 FR 23453 (2022). The effective date of the 2022 revisions was 20 May 2022, and reviews begun after this date are required to apply the 2020 regulations as modified by the Phase I revisions unless there is a clear and fundamental conflict with an applicable statute. This EA began on 7 September 2023, the date on which NMFS deemed the POA ITA application adequate and complete, and accordingly proceeds under the 2020 regulations as modified by the Phase 1 revisions.

[3] NOAA Administrative Order (NAO) 216-6A, "Compliance with the National Environmental Policy Act, Executive Orders 12114, Environmental Effects Abroad of Major Federal Actions; l1988 and 13690, Floodplain Management and 11990, Protection of Wetlands," issued 22 April 2016, and the Companion Manual for NAO 216-6A, "Policy and Procedures for Implementing the National Environmental Policy Act and Related Authorities," issued 13 January 2017.

- Chapter 2 describes the POA's proposed activities, and the alternatives carried forward for analysis as well as alternatives not carried forward for analysis.
- Chapter 3 describes the baseline conditions of the affected environment.
- Chapter 4 describes the direct, indirect, and cumulative impacts to the affected environment; specifically, it describes impacts to marine mammals and their habitat associated with NMFS' Proposed Action and alternatives.
- Chapter 5 lists document preparers and agencies consulted.
- Chapter 6 lists literature cited.

1.2 Marine Mammal Protection Act Overview

Section 101(a) of the MMPA (16 U.S.C. 1361) created a moratorium on the taking of marine mammals (16 U.S.C. 1372(a)). Additionally, Section 102 prohibits persons or vessels subject to the jurisdiction of the United States from taking any marine mammal in waters or on lands under the jurisdiction of the United States or on the high seas (16 U.S.C. 1372(a)(l), (a)(2)). Sections 101(a)(5)(A) and (D) of the MMPA provide exceptions to the prohibition on take, which give NMFS (and U.S. Fish and Wildlife Service [USFWS]) the authority to authorize the incidental but not intentional take of small numbers of marine mammals, provided certain findings are made and statutory and regulatory procedures are met. The incidental take of a marine mammal can be classified as mortality, serious injury, or harassment[4]. ITAs may be issued as either (1) regulations and an associated Letter of Authorization (LOA) or (2) an IHA. LOAs may be issued for a maximum period of 5 years and IHAs may be issued for a maximum period of 1 year and may only authorize incidental take by harassment. Detailed information about the MMPA is available at https://www.fisheries.noaa.gov/topic/laws-policies/marine-mammal-protection-act.

NMFS promulgated regulations to implement the provisions of the MMPA governing the taking and importing of marine mammals (see 50 CFR Part 216) and published application instructions that prescribe the procedures necessary to apply for ITAs. U.S. citizens and entities such as the POA, seeking to obtain authorization for the incidental take of marine mammals under NMFS jurisdiction[5] must comply with these regulations and application instructions in addition to the provisions of the MMPA. Information on the NMFS implementing regulations and application process is available at https://www.fisheries.noaa.gov/national/marine-mammal-protection/apply-incidental-take-authorization.

Once NMFS determines an application is adequate and complete, it has a corresponding duty to determine whether and how to authorize take of marine mammals incidental to the activities described in the application. To authorize the incidental take of marine mammals, NMFS must determine, using the best available science, that the taking would be of small numbers of a species or stock, would have a negligible impact on the affected marine mammal species or stocks, and would not have an unmitigable impact on the availability of such stocks for subsistence uses. NMFS must also prescribe the "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat[6], and on the availability of those species or stocks for subsistence uses, as well as monitoring and reporting requirements.

---

[4] Except with respect to certain activities not pertinent here, 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); 50 CFR 216.3.

[5] NMFS has jurisdiction over most marine species, (e.g., marine mammals and pinnipeds).

[6] Habitat includes rookeries, mating grounds, and other areas of similar significance.

1.2.1 Required Mitigation

In accordance with the MMPA, NMFS must prescribe, in the IHA, the means of effecting the least practicable adverse impact on the species or stocks of marine mammals and their habitat. To do so, NMFS considers an applicant's proposed mitigation measures and assesses how such measures could benefit the affected species or stocks and their habitat. NMFS' evaluation of potential measures includes consideration of the following factors in relation to one another: (1) the manner in which and the degree to which NMFS expects the successful implementation of the measure to minimize adverse impacts to marine mammals; (2) the proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and (3) the practicability of the measure for applicant implementation.

Though any mitigation must be evaluated in the context of the specific activity and the species or stocks affected, measures with the following types of goals are often applied to reduce the likelihood or severity of adverse species- or stock-level impacts:

- Avoidance or minimization of marine mammal injury, serious injury, or death whenever possible;
- Reduction in the number of marine mammals taken (total number or number at a biologically important time or location);
- Reduction in the number of times the activity takes individual marine mammals (total number or number at a biologically important time or location);
- Reduction in the degree of effect of the anticipated takes (either total number or number at a biologically important time or location);
- Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time; and
- For monitoring related directly to mitigation, an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Mitigating adverse effects to marine mammals is intended to reduce the likelihood that the activity will result in energetic or other types of impacts that are more likely to result in reduced recruitment or survivorship. It is also important to consider the degree of impacts that were expected in the absence of mitigation in order to assess the benefits of any potential measures. Finally, because the least practicable adverse impact standard authorizes NMFS to weigh a variety of factors when evaluating appropriate mitigation measures, it does not compel mitigation for every kind of individual take, even when practicable for implementation by the applicant.

In their application, the POA proposed several avoidance, minimization, and mitigation measures, outlined in Section 2.2.3.2, which would apply to all marine mammals. After discussions with the POA, NMFS has identified additional required mitigation measures. These measures are discussed in detail in the *Federal Register* (FR) notice of the proposed IHA (88 FR 76576, 6 November 2023) and will be included in the final IHA, if issued. Through the MMPA IHA process, NMFS evaluated whether the proposed measures would constitute effecting the least practicable adverse impact. The final IHA, if issued, would contain mitigation requirements developed through the consultation and authorization processes and summarized in the Final EA.

1.2.2 Required Monitoring and Reporting

In order to issue an IHA for an activity, Section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing

regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical to compliance as well as to ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

(1) Occurrence of marine mammal species or stocks in the area in which take is anticipated (e.g., presence, abundance, distribution, density).

(2) Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of:

   a. Action or environment (e.g., source characterization, propagation, ambient noise);

   b. Affected species (e.g., life history, dive patterns);

   c. Co-occurrence of marine mammal species with the action; or

   d. Biological or behavioral context of exposure (e.g., age, calving or feeding areas).

(3) Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors.

(4) How anticipated responses to stressors impact either:

   a. Long-term fitness and survival of individual marine mammals; or

   b. Populations, species, or stocks.

(5) Effects on marine mammal habitat (e.g., marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat).

(6) Mitigation and monitoring effectiveness.

In their application, the POA proposed several monitoring and reporting measures, outlined in Section 2.2.3.1, which would apply to all marine mammals. General monitoring plan criteria are discussed in Section 13 of the NES1 Project IHA application, in the FR notice of the proposed IHA (88 FR 76576, 6 November 2023) and will be included in the final IHA, if issued. Additional information is found in the Marine Mammal Monitoring and Mitigation Plan in Appendix B of the IHA application (available at https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities). The final IHA, if issued, would contain the monitoring and reporting requirements developed through the consultation and authorization processes and summarized in the Final EA.

1.3 Summary of the Applicant's Incidental Take Authorization Request

The POA, located in Anchorage, Alaska, in the Knik Arm in upper Cook Inlet, provides critical infrastructure for the citizens of Anchorage and a majority of the residents of Alaska. Marine-side infrastructure and facilities at the POA were constructed largely in the 1960s and are in need of replacement because they are substantially past their design life and in poor and deteriorating structural condition. To address these deficiencies, the POA is modernizing its marine terminals through the Port of Alaska Modernization Program (PAMP) to enable safe, reliable, and cost-effective port operations. The PAMP would support infrastructure resilience in the event of a catastrophic natural disaster over a 75-

year design life. The projects associated with the PAMP each have independent utility and require separate authorizations. PAMP projects include:

- Phase 1: Petroleum and Cement Terminal (PCT) and South Floating Dock (SFD) replacement;
- Phase 2A: NES1;
- Phase 2B: General Cargo Terminals Replacement (construction planned to begin in 2025);
- Phase 3: Petroleum, Oil and Lubricants Terminal 2 Replacement;
- Phase 4: NES2; and
- Phase 5: Demolition of Terminal 3.

Phase 1 of the PAMP was completed in 2022. IHAs were issued by NMFS for both the PCT (85 FR 19294, 6 April 2020) and SFD projects associated with this Phase (86 FR 50057, 7 September 2021). The NES Project would be completed in two distinct steps, NES1 and NES2, separated by multiple years and separate permitting efforts. The project discussed herein, NES1, is Phase 2A of the PAMP. Ground improvement work in preparation for NES1 began in 2023, and on-shore and in-water work for NES1 is planned to commence in April 2024. This EA has been prepared to support the POA's request for an IHA for NES1.

The North Extension (the area north of the existing general cargo docks) bulkhead structure was constructed between 2005 and 2011 under the Port Intermodal Expansion Project, the predecessor effort to the PAMP. The POA considers the North Extension a failed structure. Parts of the North Extension bulkhead structure and the surrounding upland area are unstable and collapsing, and some of the sheet piles are visibly twisted and buckled. The structure presents safety hazards and logistical impediments to ongoing port operations, and much of the upland area is currently unusable. The North Extension, in particular, has independent utility from other Phases in the PAMP because the failing structure must be demolished for these reasons. The NES1 Project would result in removal of the failed sheet pile structure and reconfiguration and realignment of the shoreline in the North Extension. NES1 would include the conversion of approximately 13 acres of developed land back to intertidal and subtidal habitat in Knik Arm. While the majority of the Project would be demolition work, the term "construction" as used herein refers to both construction and demolition work.

Proposed activities included as part of the NES1 Project with potential to affect marine mammals in the waterways adjacent to the POA include in-water vibratory installation and removal of temporary stability template piles, and vibratory removal of sheet piles. It is also possible that a small number of strikes by an impact hammer would be used to loosen sheet piles. Alternative means of pile removal include dredging or excavation to reduce further pile embedment and cutting sheet piles using hydraulic shears or underwater ultrathermic cutting.

1.4 Purpose and Need

1.4.1 Description of Proposed Action

NMFS proposes to issue an IHA to the POA pursuant to Section 101(a)(5)(D) of the MMPA and 50 CFR 216. The IHA would be valid from 1 April 2024 through 31 March 2025 and may be renewed for an additional year, as long as the applicant satisfies certain conditions and meets all necessary requirements. The IHA, if issued, would authorize take of a small numbers of seven species of marine mammals by Level B harassment and two of the seven species by Level A harassment incidental to vibratory and impact pile installation and removal associated with the construction of the NES1 Project. No serious injury or mortality is anticipated or would be authorized; therefore, an IHA is appropriate. NMFS' Proposed Action (i.e., issuance of the IHA) is a direct outcome of the POA requesting an authorization to take small numbers of marine mammals incidental to NES1 construction activities. Additional details about NMFS' Proposed Action is provided in the FRN of the proposed IHA published in the *Federal Register* (FR) on 6 November 2023 (88 FR 76576) and will be included in the final IHA, if

issued. The proposed IHA does not permit or authorize the POA's NES1 Project activities, only the take of marine mammals incidental to those activities.

1.4.2 Purpose

The purpose of NMFS' Proposed Action is to authorize take under the MMPA of marine mammals incidental to the POA's proposed activity. The acoustic stimuli from vibratory pile installation and vibratory and impact removal have the potential to harass, as defined under the MMPA, marine mammals in and near the NES1 construction area. Seven species of marine mammals may be taken by Level B (behavioral) harassment and two of those seven species may also be taken by Level A (physical) harassment. No mortality or serious injury is anticipated or authorized in the IHA. Therefore, the activity warrants an IHA from NMFS.

The IHA, if issued, would provide an exemption to the POA from the take prohibitions contained in the MMPA. To authorize the incidental take of small numbers of marine mammals, NMFS must evaluate the best available scientific information to determine whether the take would have a negligible impact on marine mammals or stocks and whether the activity would have an unmitigable impact on the availability of affected marine mammal species for subsistence use. In addition, NMFS must prescribe, in an IHA, the permissible methods of taking and other means of effecting the least practicable adverse impact on the species or stocks of marine mammals and their habitat, paying particular attention to rookeries, mating grounds, and other areas of similar significance. If appropriate, NMFS must prescribe means of effecting the least practicable adverse impact on the availability of the species and/or stocks of marine mammals for subsistence uses. NMFS also must include requirements or conditions pertaining to monitoring and reporting. Thus, the purpose of NMFS' action—which is a direct outcome of the POA's request for authorization to take marine mammals incidental to their proposed NES1 construction (specifically, pile installation and removal)—is to evaluate the information in the POA's application pursuant to the MMPA and 50 CFR 216 and issue the requested ITA, if appropriate.

1.4.3 Need

U.S. citizens seeking to obtain authorization for the incidental take of marine mammals under NMFS' jurisdiction must submit a request (in the form of an application). Once NMFS determines that an application is adequate and complete, NMFS has a corresponding duty to determine whether and how to authorize take of marine mammals incidental to the activities described in the application. On 7 September 2023, NMFS determined that the POA submitted an adequate and complete application demonstrating the need and potential eligibility for an IHA under the MMPA. The need for NMFS' Proposed Action is to consider the impacts of authorizing the requested take on marine mammals and their habitat. NMFS' responsibilities under Section 101(a)(5)(D) of the MMPA and its implementing regulations establish and frame the need for NMFS' Proposed Action.

1.5 Environmental Review Process and Background

Under NEPA, federal agencies are required to examine the environmental impacts of their proposed actions within the U.S. and its territories. A NEPA analysis is a concise public document that provides an assessment of the potential effects a major federal action may have on the human environment. Major federal actions include activities that federal agencies fully or partially fund, regulate, conduct, or approve. Because NMFS' issuance of an IHA to the POA would allow for the taking of marine mammals, consistent with provisions under the MMPA and incidental to the applicant's lawful activities, NMFS considers this a major federal action subject to NEPA; therefore, NMFS analyzed the environmental effects associated with authorizing incidental takes of marine mammals and prepared the appropriate NEPA documentation. In addition, NMFS, to the fullest extent possible, integrates the requirements of NEPA with other regulatory processes required by law or by agency practice so that all procedures run concurrently, rather than consecutively. This includes coordination within NOAA and with other

regulatory agencies, as appropriate, during NEPA reviews prior to implementation of the Proposed Action to ensure that requirements are met. Regarding the issuance of ITAs, NMFS relies substantially on the public process required by the MMPA for proposed ITAs, to develop and evaluate relevant environmental information and provide a meaningful opportunity for public participation when NMFS prepares NEPA documents. NMFS considers public comments received in response to the publication of the proposed IHA during the NEPA review process.

1.5.1 Scoping and Public Involvement

The NEPA process enables NMFS to make decisions based on an understanding of the environmental consequences of a proposed action and take actions to protect, restore, and enhance the environment. Although agency procedures do not require publication of the draft EA prior to finalizing an EA, NMFS relies substantially on the public process pursuant to the MMPA to develop and evaluate environmental information relevant to an analysis under NEPA. Concurrent with publication of the draft EA, NMFS published the notice of the proposed IHA in the FR for review and comment on 6 November 2023 (88 FR 76576). There, NMFS alerted the public that it intends to use the MMPA public review process to solicit relevant environmental information and provide the public an opportunity to submit comments. NMFS alerted the public that the draft EA was available on the internet within the notice of the proposed IHA.

The *Federal Register* notice (FRN) of the proposed IHA (88 FR 76576) included a detailed description of the Proposed Action, the potential effects of the Project on marine mammals, their habitat and subsistence uses, proposed mitigation and monitoring measures to avoid and minimize potential adverse impacts on marine mammals and their habitat, proposed reporting measures, and NMFS' preliminary findings. The FRN of the proposed IHA, the draft EA, and the corresponding public comment period are instrumental in providing the public with information regarding relevant environmental issues and offering the public a meaningful opportunity to provide comments for our consideration in both the MMPA and NEPA processes.

During the 30-day public comment period for the proposed IHA to POA (88 FR 76576), NMFS received comment letters from Eklunta, Inc. requesting that Alaska Native residents with traditional knowledge about marine mammals and the local marine environment be involved in the monitoring and support roles related to the project (i.e., as Protected Species Observers [PSOs]), and from the Center for Biological Diversity (CBD) opposing the ITA. CBD also commented that the draft EA was inadequate and that it fails to comply with the requirements of NEPA. They stated that it fails to consider a reasonable range of alternatives, lacks a meaningful environmental and cumulative impacts analysis, and that NMFS must prepare an EIS for this project. All comments received in response to the publication of the proposed IHA and draft EA were considered and those applicable, used to inform the analysis in this Final EA. As such, the discussion of take estimates and the cumulative effects analysis was updated, as reflected in this Final EA. A more detailed summary of all comments, and NMFS' responses to those comments, would be included in the FRN of the final IHA, if issued. Additionally, all public comments will be made available online at https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities.

1.5.2 Compliance with Other Environmental Laws or Consultations

NMFS must comply with all applicable federal environmental laws and regulations necessary to implement a proposed action. NMFS' evaluation of and compliance with environmental laws and regulations is based on the nature and location of the applicant's proposed activities and NMFS' Proposed Action. Therefore, this section summarizes only environmental laws and consultations applicable to NMFS' issuance of an IHA to the POA.

1.5.2.1 The Endangered Species Act

The Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.) establishes a national policy for conserving threatened and endangered (T&E) species of fish, wildlife, plants, and the habitat they depend on. NMFS and USFWS jointly administer the ESA and are responsible for listing a species as T&E, designating critical habitat[7], developing and implementing protective regulations and recovery plans[8], and undertaking several other management and conservation efforts pursuant to the ESA. Other management and conservation efforts include monitoring and evaluating the status of listed species, candidate species[9] or species proposed for listing[10], and recently delisted species as well as consulting on federal actions that may affect a listed species or its designated critical habitat. The ESA generally prohibits the "take"[11] of an ESA species listed as endangered unless an exception or exemption applies. NMFS extended the "take" prohibition to ESA-listed threatened species under its jurisdiction through promulgation of protective rules. However, as discussed below, federal agencies and applicants for federal permits may receive exemption from incidental take through the Section 7 consultation process. Section 7(a)(2) of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of T&E species, or adversely modify or destroy their designated critical habitat. Federal agencies must do so in consultation with NMFS and/or USFWS for actions that may affect species listed per Section 4 of the ESA as threatened or endangered or critical habitat designated for such species (per Section 4 of the ESA). Formal consultation with NMFS and USFWS is required unless exceptions per 50 CFR 402.14(b) apply.

When a federal action agency determines, through a Biological Assessment (BA) or other review, that an action is likely to adversely affect a listed species or result in the destruction or adverse modification of critical habitat, the federal action agency initiates the formal consultation process by submitting a request for formal consultation to the consulting agency (see 50 CFR 402.14). Section 7(b)(3) of the ESA requires that at the conclusion of formal consultation, the consulting agency provides an opinion stating whether the federal action agency's action is likely to jeopardize ESA-listed species or destroy or adversely modify designated critical habitat. A similar opinion is included for proposed species or proposed critical habitat if either or both were part of the consultation. If the consulting agency determines the action is likely to jeopardize ESA-listed species or destroy or adversely modify critical habitat, they then provide a reasonable and prudent alternative that may allow the action to proceed in compliance with Section 7(a)(2) of the ESA. If a federal action will cause incidental take and is reasonably certain to occur and certain conditions are met, Section 7(b)(4) of the ESA requires the consulting agency to provide an Incidental Take Statement (ITS) that specifies the impact of any incidental taking and includes mandatory reasonable and prudent measures to avoid, minimize, and

---

[7] Critical habitat is a specific area within a geographical area occupied by the species at the time of listing that has physical or biological features essential to conservation of the species and that may require special management considerations or protection and specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

[8] Section 4(f) of the ESA directs NMFS to develop and implement recovery plans for T&E species. Each species has different needs and requires different conservation strategies to achieve recovery. Recovery is the process of restoring listed species and their ecosystems to the point that they no longer require ESA protections. A key role of NMFS in recovering species is to set goals for each species' recovery comeback through the development of recovery plans.

[9] Candidate species are species in the listing petition and for which NMFS determined the listing is warranted pursuant to Section 4(b)(3)(a) of the ESA. Per 71 FR 61022, candidate species also include species that are not the subject of a petition but for which NMFS announced initiation of a status review of the species.

[10] Species proposed for listing are those candidate species found to warrant listing as threatened or endangered and officially proposed for listing in the *Federal Register* after completion of a status review. A public comment period is associated with NMFS' proposal to list a species as threatened or endangered, and NMFS generally has 1 year after a species is proposed for listing to make a final determination whether to list a species as threatened or endangered.

[11] Take, as defined in Section 3 of the ESA, means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

mitigate such impacts and terms and conditions to implement the reasonable and prudent measures. An agency or applicant's compliance with these measures exempts the incidental take from the ESA take prohibition.

Marine mammals under NMFS' jurisdiction that are listed as T&E under the ESA with confirmed or possible occurrence in the proposed Project area (i.e., upper Cook Inlet) are the Cook Inlet Distinct Population Segment (DPS) of beluga whales (*Delphinapterus leucas*); the Western DPS of Steller sea lions (*Eumetopias jubatus*); and the Mexico DPS and Western North Pacific DPS of humpback whales (*Megaptera novaeangliae*). Although critical habitat for the Cook Inlet beluga whale exists in Cook Inlet, the area around the NES1 Project site is within the Beluga Critical Habitat Exclusion Area (See Section 3.2.1).

NMFS OPR's issuance of an IHA is a federal action subject to the requirements of Section 7 of the ESA. As a result, NMFS OPR is required to consult and ensure the issuance of the IHA to the POA, is not likely to jeopardize the continued existence of any T&E species or result in the destruction or adverse modification of designated critical habitat for these species. On 30 October 2023, NMFS OPR requested a Section 7 consultation with the NMFS Alaska Regional Office (AKRO) on the proposed issuance of an IHA to the POA. Formal consultation between NMFS OPR and AKRO concluded, and NMFS AKRO issued a Biological Opinion (BiOp) on 15 December 2023 (NMFS 2023). The BiOp found that OPR's Proposed Action is not likely to jeopardize the continued existence or recovery of the Cook Inlet beluga whale, the Mexico DPS and Western North Pacific DPS of humpback whales, and the Western DPS of Steller sea lions nor adversely modify listed critical habitat. Furthermore, AKRO found that the proposed action is not likely to destroy or adversely modify designated critical habitat for Cook Inlet beluga whales or the western DPS of Steller sea lion. There is no critical habitat designated for humpback whales in the action area.

1.5.2.2 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) was enacted to address impacts to fisheries on the U.S. continental shelf. It established U.S. fishery management over fishes within the Fishery Conservation Zone from the seaward boundary of the coastal states out to 200 nautical miles (nmi) (i.e., the boundary of the U.S. Exclusive Economic Zone [EEZ]). The MSFCMA also established regulations for foreign fishing within the Fishery Conservation Zone and issued national standards for fishery conservation and management to be applied by regional fishery management councils. Each council is responsible for developing Fishery Management Plans for domestic fisheries within its geographic jurisdiction. In 1996, Congress enacted amendments to the MSFCMA, known as the Sustainable Fisheries Act (SFA) of 1996 (Public Law 104-297), to address substantially reduced fish stocks resulting from direct and indirect habitat loss. Under the MSFCMA, federal agencies are required to consult with the Secretary of Commerce with respect to any action authorized, funded, or undertaken or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect essential fish habitat (EFH) identified under the MSFCMA. EFH is defined as the waters and substrate necessary to fishes or invertebrates for spawning, breeding, feeding, and growth to maturity. Areas designated as EFH contain habitat essential to the long-term survival and health of U.S. fisheries. This typically includes aquatic areas and their associated physical, chemical, and biological properties used by fish, and may include areas historically used by fish. Substrate types include sediment, hard bottom, structures underlying the waters, and associated biological communities. NMFS recommends consolidated EFH consultations with interagency coordination procedures required by other statutes such as NEPA or the ESA (50 CFR 600.920(e)(1)) to reduce duplication and improve efficiency. If an action may adversely affect EFH, the applicant must consult with NMFS to identify conservation measures to minimize or

avoid adverse impacts. If NMFS identifies conservation measures, the applicant must determine whether it will implement them and provide a formal response if it fails to do so.

The North Pacific Fishery Management Council has identified estuarine and marine waters in the vicinity of the POA as EFH for Chinook (*Oncorhynchus tshawytscha*), chum (*O. keta*), coho (*O. kisutch*), sockeye (*O. nerka*), and pink (*O. gorbuscha*) salmon (NPFMC 2021). Marine EFH for Pacific salmon (*Oncorhynchus* spp.) in Alaska includes all estuarine and marine areas used by Pacific salmon of Alaska origin, extending from the influence of tidewater and tidally submerged habitats to the limits of the U.S. EEZ (NPFMC 2016).

Eulachon (*Thaleichthys pacificus*), longfin smelt (*Spirinchus thaleichthys*), and low numbers of Pacific cod (*Gadus macrocephalus*), walleye pollock (*Theragra chalcogramma*), Pacific herring (*Clupea pallasii*), and Pacific staghorn sculpin (*Leptocottus armatusspecies*) have also been captured in upper Cook Inlet (Houghton et al. 2005; NMFS 2016a). Based on available general distribution data, estuarine and marine waters in the POA's vicinity are designated as EFH for Pacific cod, walleye pollock, sablefish (*Anoplopoma fimbria*), yellowfin sole (*Limanda aspera*), northern rock sole (*Lepidopsetta polyxystra*), southern rock sole (*L. billineta*), Alaska plaice (*Pleuronectes quadrituberculatus*), rex sole (*Glyptocephalus zachirus*), and flathead sole (*Hippoglossoides elassodon*) larvae and Alaska plaice and dover sole (*Microstomus pacificus*) eggs, all of which may occur in summer; and adult Kamchatka flounder (*Atheresthes evermanni*), which may occur in spring (NPFMC 2020; NMFS 2022b). Available data are insufficient to identify EFH for species in the forage fish complex (e.g., eulachon) (Matt Eagleton, personal communication, 01 September 2016; NPFMC 2020). In addition, streams, lakes, ponds, wetlands, and other water bodies that support Pacific salmon, as identified by the Alaska Department of Fish and Game (ADF&G) *Anadromous Waters Catalog* (Giefer and Blossom 2020), are considered freshwater EFH for Pacific salmon.

Under the 2017 Office of Habitat Conservation guidance on EFH and ITAs, NMFS has determined that the issuance of the IHA will not result in adverse impacts to EFH and, further, that it will not require separate consultation per Section 305(B)(2) of the MSFCMA as amended by the SFA (Public Law 104-267).

1.6 Document Scope

The analysis in this EA addresses potential effects or impacts on marine mammals and their habitat resulting from NMFS' Proposed Action to authorize incidental take associated with the vibratory pile installation and vibratory and impact pile removal activities proposed by the POA for the NES1 Project. Under the 2022 revised CEQ NEPA regulations, effects or impacts are defined as: changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and include (1) direct effects, which are caused by the action and occur at the same time and place; (2) indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable; (3) cumulative effects, which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions[12] (40 CFR 1508.1(g)). Any effect evaluated in this analysis has been determined to be reasonably foreseeable. However, the scope of this analysis is limited to the decision for which NMFS is responsible (i.e., whether to issue the IHA). This EA is intended to provide focused information on the primary issues and impacts of environmental concern, which include NMFS' issuance of the IHA authorizing the take of

[12] The regulatory definition of effects or impacts also reads, "Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial." Section 4.1 describes how impacts are assessed.

marine mammals incidental to the POA's pile installation and removal activities (including vibratory installation and removal of temporary piles, vibratory removal of sheet piles, and use of an impact hammer on sheet piles), and the mitigation and monitoring measures to minimize the effects of that take. For these reasons, this EA does not provide a detailed evaluation of the effects on the elements of the human environment listed in Table 1.

Table 1. Elements of the Environment Not Carried Forward for Analysis

Biological	Physical	Socioeconomic/Cultural
Humans	Air Quality	Commercial Fishing
Fisheries Resources and Essential Fish Habitat	Farmland Geography	Historic and Cultural Resources
Invertebrates	Geology/Sediments	Indigenous Cultural Resources
Invasive Species	Land Use	Low-Income Populations
Marine and Coastal Birds	Oceanography	Military Activities
Sea Turtles	State Marine Protected Areas	Minority Populations
Threatened and Endangered Fishes	Federal Marine Protected Areas	National Historic Preservation Sites
Benthic Communities	National Estuarine Research Reserves	Other Marine Uses: Military Activities, Shipping and Marine Transportation, and Boating
	National Marine Sanctuaries	Recreational Fishing
	National Wildlife Refuges	Public Health and Safety
	Park Land	
	Water Quality	
	Wetlands	
	Wild and Scenic Rivers	

Chapter 2 Alternatives

As described in Chapter 1, the NMFS Proposed Action is to issue an IHA to the POA to authorize the take of small numbers of marine mammals incidental to the POA proposal to construct the NES1 Project in Anchorage Alaska, located in Knik Arm in upper Cook Inlet. While the majority of the Project will be demolition work, this document uses the term "construction" as encompassing both construction and demolition. NMFS' Proposed Action is triggered by the POA's request for the IHA per the MMPA (16 U.S.C. 1361 et seq.). In accordance with NEPA and the 2022 revised CEQ regulations, NMFS is required to consider a reasonable range of alternatives to a Proposed Action, as well as a No Action Alternative. Reasonable alternatives means a reasonable range of alternatives that are technically and economically feasible, and meet the purpose and need for the proposed action (40 CFR 1508.1(z)). The evaluation of alternatives under NEPA assists NMFS with understanding and, as appropriate, minimizing impacts through an assessment of alternative ways to achieve the purpose and need for its Proposed Action. Reasonable alternatives are carried forward for detailed evaluation under NEPA, while alternatives considered but determined not to meet the purpose and need are not carried forward. For the purposes of this EA, an alternative will meet the purpose and need only if it satisfies the requirements of Section 101(a)(5)(D) of the MMPA. Therefore, NMFS applied the screening criteria and considerations outlined in Section 2.1 to the alternatives to identify which alternatives to carry forward for analysis. Accordingly, an alternative must meet these criteria to be considered "reasonable."

2.1 Criteria and Considerations for Selecting Alternatives

Per Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses ("least practicable adverse impact"). NMFS does not have a regulatory definition for "least practicable adverse impact." NMFS must also find that the authorized taking does not have an unmitigable adverse impact on the availability of marine mammal species or stocks for subsistence uses.

NMFS' implementing regulations require applicants to include information about the "availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat" (50 CFR 216.104(a)(11)). In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, NMFS carefully considered two primary factors:

(1) The manner, and the degree to which, implementation of the measure(s) is expected to reduce impacts to marine mammal species or stocks, their habitat, and their availability for subsistence uses (when relevant). This analysis considers such things as the nature of the potential adverse impact (such as likelihood, scope, and range), the likelihood that the measure will be effective if implemented, and the likelihood of successful implementation.

(2) The practicability of the measure for applicant implementation. Practicability of implementation may consider such things as cost, impact on operations, personnel safety, and practicality of implementation.

While the language of the least practicable adverse impact standard calls for minimizing impacts to affected species and stocks, NMFS recognizes that the reduction of impacts to those species or stocks accrues through the application of mitigation measures that limit impacts on individual animals. Accordingly, our analysis focuses on measures designed to avoid or minimize impacts to marine mammals from activities that are likely to increase the probability or severity of population-level effects,

including auditory injury or disruption of important behaviors, such as foraging, breeding, or mother/calf interactions. To satisfy the MMPA's least practicable adverse impact standard, NMFS proposes a suite of basic mitigation protocols that are required regardless of the status of a stock. Additional or enhanced protections are proposed for species whose stocks are in poor health and/or are subject to some significant additional stressor that lessens that stock's ability to weather the effects of the specified activity without worsening its status.

In the evaluation of specific measures, the details of the specified activity will necessarily inform each of the two primary factors discussed above (expected reduction of impacts and practicability), and will be carefully considered to determine the types of mitigation that are appropriate under the least practicable adverse impact standard. Analysis of how a potential mitigation measure may reduce adverse impacts on a marine mammal stock or species and practicability of implementation are not issues that can be meaningfully evaluated through a binary lens. The manner in which, and the degree to which, implementation of a measure is expected to reduce impacts, as well as its practicability in terms of these considerations, can vary widely. For example, a time/area restriction could be of very high value for decreasing population-level impacts (e.g., avoiding disturbance of feeding females in an area of established biological importance) or it could be of lower value (e.g., decreased disturbance in an area of high productivity but of less firmly established biological importance). Regarding practicability, a measure might involve operational restrictions that completely impede the operator's ability to carry out the project (higher impact), or it could mean additional incremental delays that increase operational costs but still allow the activity to be conducted (lower impact). Expected effects of the activity and of the mitigation, as well as status of the stock, all weigh into these considerations. Accordingly, the greater the likelihood that a measure will contribute to reducing the probability or severity of adverse impacts to the species or stock, the greater the weight that measure is given when considered in combination with practicability to determine the appropriateness of the mitigation measure, and vice versa.

2.2 Description of the Applicant's Specified Activities

2.2.1 Specified Geographic Area

The POA is located in the industrial waterfront of Anchorage, Alaska, in Knik Arm in upper Cook Inlet (Figure 1). The Project site is located in Sections 6 and 7, Township 13 North, Range 3 West, Seward Meridian; U.S. Geological Survey Quadrangle Map Anchorage A-8; Latitude 61° 15' North, Longitude 149° 52' West. The POA's boundaries currently occupy an area of approximately 129 acres. The perpendicular distance to the western bank directly across Knik Arm from the POA is approximately 4.2 kilometers (km; 2.6 miles [mi]).

Figure 1. Port of Alaska location in Anchorage, Alaska, in Knik Arm in upper Cook Inlet, including the proposed NES1 Project area

2.2.2 Applicant's Proposed Project

The purpose of the NES Project is to stabilize the previously failed NES bulkhead structure, and create a new shoreline that is structurally and seismically stable as well as to balance the preservation of uplands created in the past while addressing the formation of unwanted sedimentation within the USACE Anchorage Harbor. The NES Project would also improve safety for maneuvering vessels at the northern berths. Previous establishment of the North Extension changed the hydrodynamics of the area and resulted in more rapid accumulation of material at the existing cargo dock faces, as well as a smaller turning area for vessels. The Municipality of Anchorage and the POA have identified the NES Project as a priority for the PAMP, due to the impact of the existing structure's geometry upon USACE's Anchorage Harbor Project, mariners' concerns regarding impacts to safe ship-berthing operations, and engineering concerns regarding structural and geotechnical stability of the system. The existing structure poses significant risk for continued deterioration and could result in significant release of impounded fill material into the port's vessel operating and mooring areas, and into the USACE's Anchorage Harbor Project. Accordingly, a significant portion of the NES Project work has been designated for inclusion in NES1 as Phase 2A PAMP efforts, specifically those portions of the existing structure that are closest to the north end of the existing cargo terminals. Creation of a safe and stable uplands area would support POA operations while also addressing concerns of adverse impacts upon USACE's Federal Navigation Channel and Dredging Program.

Existing North Extension Structure

The existing North Extension bulkhead structure is an Open Cell Sheet Pile (OCSP) design. Demolition of the existing OCSP structure would include removal and disposal of the southerly OCSP bulkhead walls and associated backlands. The OCSP bulkhead is an earthen-filled retaining structure of 29 interconnected open cells, each approximately 27 feet (ft) wide, with 30 tailwalls that are up to 200 ft long (Figure 2). Each cell is about 20 sheets wide across the face, which is along the water, and each tailwall consists of approximately 118 sheet piles that extend landward into the filled area, orthogonal to the sheet piles along the face (Table 2; Figure 3). The sheet piles interlock through a series of thumb-finger joints or interlocks (where two sheet piles are connected along their length; Figure 4) along the cell faces and tailwalls. Wye joints occur where three sheet piles are connected at the interface between two neighboring sheet pile cell faces and the adjoining tailwall (Figure 5). Two z-pile closure walls close the gaps between the structures, one on each end of the bulkhead (Figure 3). The total number of sheet piles that would be removed is about 4,216. Although the exact number of sheet piles in the existing failed structure is not known with certainty.

Table 2. Anticipated Approximate Numbers of Structural Features and Sheet Piles to be Removed

Sheet Pile Type	Pile Size	Structural Feature	Number of Structures	Average Number of Sheets per Structure	Total Number of Sheets
PS 27.5 and PS 31	19.69 inches (50 cm)	Tailwalls	30	118	3,536
PS 27.5 and PS 31	19.69 inches (50 cm)	Cell Faces (Bulkhead)	29	20	568
PZC26 Z-piles	27.88 inches (70 cm)	Closure Walls	2	56	112
Total	**—**	**—**	**—**	**—**	**4,216**

Notes: cm = centimeter(s)

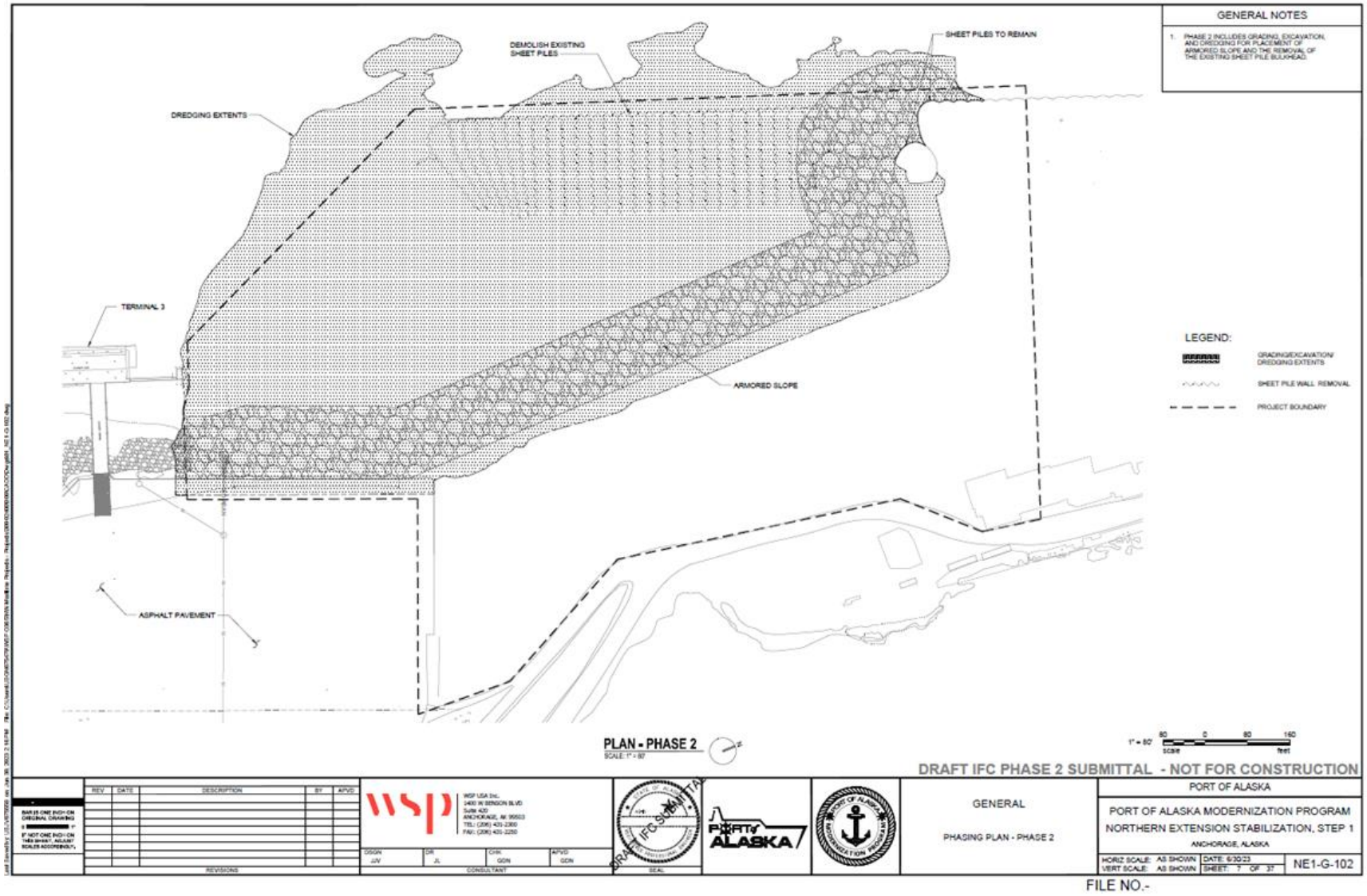


Figure 2. Plan Drawing of the North Extension Upland Areas and Sheet Pile Cells, Bulkhead, and Tailwalls to be Demolished as part of the NES1 Project

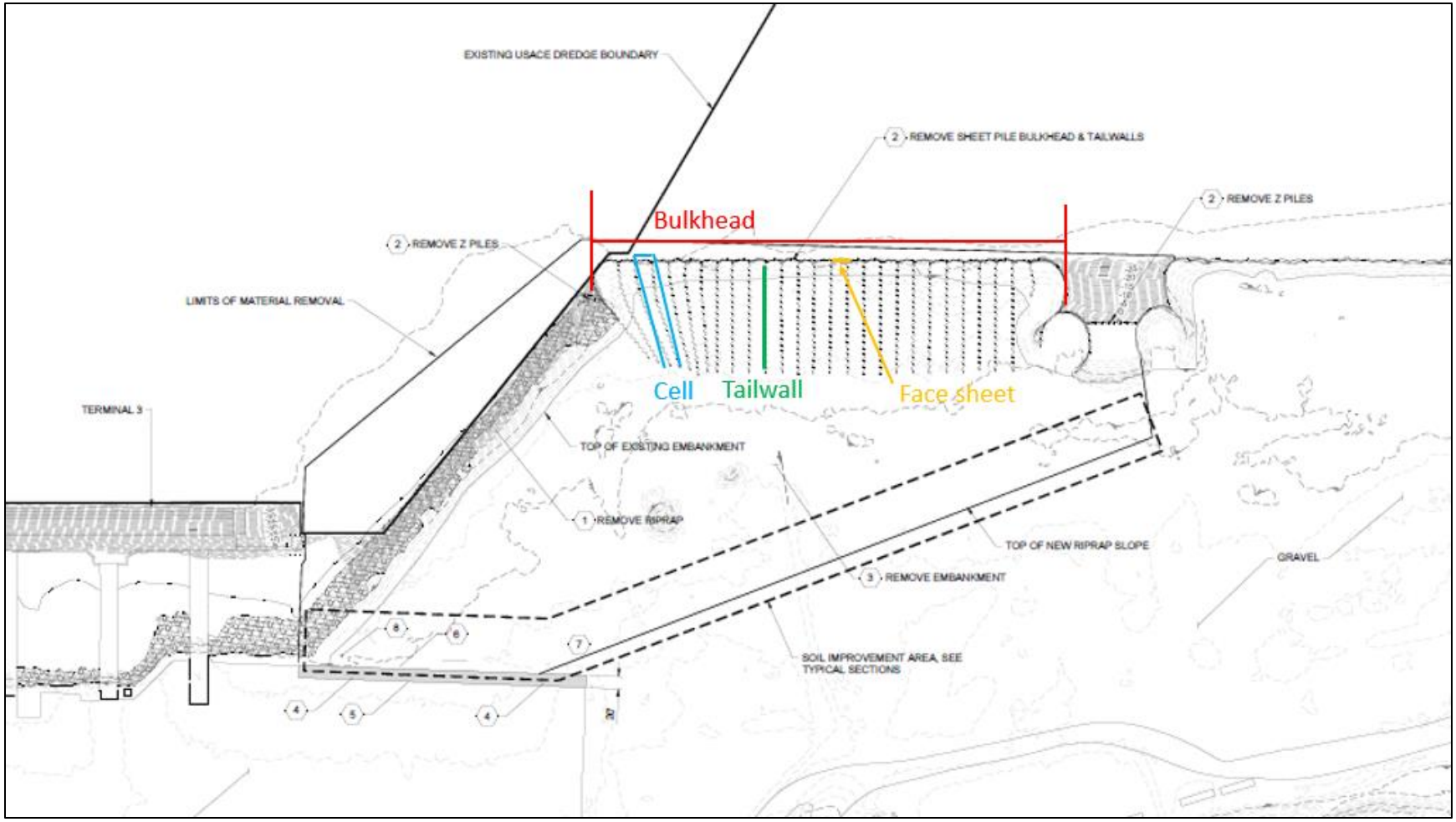
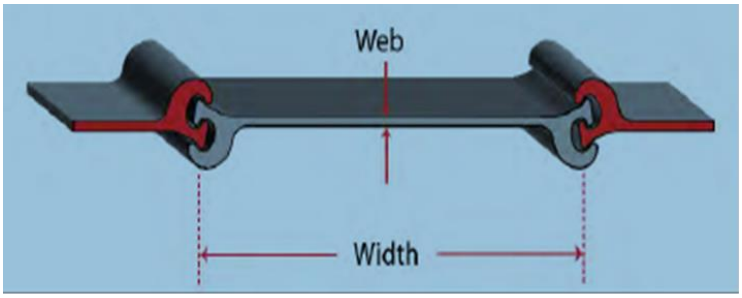


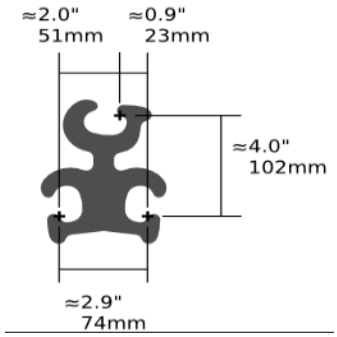
Figure 3. Schematic Identifying Individual Components of the North Extension Sheet Pile Cells, Bulkhead, Closure Walls, and Tailwalls to be Demolished as part of the NES1 Project



PS31/PS27.5 Flat Sheet Piling (L.B. Foster, 2011)

Figure 4. Typical Sheet Pile in the North Extension Bulkhead and Tailwalls With Thumb and Finger Interlock

Photo showing connection of tailwall sheet (left) to face sheets of adjoining cells



Wye connector in cross section showing approximate dimensions

Figure 5. Wye Interlock Connecting North Extension Bulkhead Cell Faces and Tailwalls

Demolition of the failed sheet pile structure would be accomplished through excavation and dredging of impounded soils (fill material), and cutting and removal of the existing sheet piles, most likely through use of a splitter and vibratory hammer. Demolition of the OCSP cell components will not commence until ground improvements necessary to protect the horizontal to vertical ratio (H:V) of 2H:1V embankment slope have been completed. Ground improvements are scheduled for 2023 and are underway. The sequencing of in-water events, including how construction would proceed while maintaining stability among the structure's cells, is unknown. It is anticipated that the actual methods, including types of equipment and numbers of hours and days of each activity, would be determined based on the engineering specifications for the NES1 project as determined by the Construction Contractor and the Design Build Team designer of record (DOR). The NES1 DOR and Construction Contractor have been selected by the POA, but their Construction Work Plan has not yet been completed and some actual construction techniques are likely to be refined adaptively as construction advances due to the stability risk of the existing impounded materials. The following project description is based on the best available information at this time considering the POA's knowledge of the condition of the North Extension and their experience with similar marine construction and demolition projects.

2.2.2.1 NES1 Project Activities

The NES1 Project would result in a reconfiguration and realignment of the shoreline through removal of the failed sheet pile structure to stabilize the North Extension. Before NES1 commences, the upland area will be prepared with ground improvements to stabilize the existing fill. Ground improvements will take

place in the dry, landward of the existing failed sheet pile structure and underneath the area where filter rock and armor rock will later be placed to stabilize the new shoreline. Ground improvement work began in 2023. Of the following activities, this document focuses its analysis on the in-water construction activities of installation and removal of temporary piles, and removal of sheet piles (i.e., within the project footprint), because those would be the only activities with the potential for effects to marine mammals and their habitat.

Construction of NES1 will include completion of the following tasks:

- Dredging and offshore disposal of approximately 1.35 million cubic yards (CY) of material down to 39 ft MLLW
- Excavation of 115,000 CY of material
- Demolition and removal of failed existing sheet pile structure
- Shoreline stabilization, including placement of granular fill, filter rock, and armor rock along the new face of the shoreline

NES1 would remove approximately half of the North Expansion structure extending approximately 900 ft north from the southern end of the North Extension. NES1 would also stabilize the remaining portion of the North Extension by creating an end-state embankment with a top elevation of +38.0 ft MLLW, sloping to a toe elevation of approximately -40.0 ft MLLW. The lower portion of the embankment slope from -40.0 ft MLLW to approximately 0 ft MLLW would be constructed with a 6 horizontal to 1 vertical (6H:1V) slope and would be unarmored. A grade-break would occur above these elevations as the slope would transition to a 2 horizontal to 1 vertical (2H:1V) slope armored rock revetment. Approximately 13 acres of intertidal and subtidal habitat will be re-created.

At the cell faces, the depth of the face wall sections varies, with most extending from a tip elevation of approximately -60 Mean Lower Low Water (MLLW) to a cutoff elevation of approximately +30 ft MLLW (90 ft long). The mudline at the face sheets varies but is thought to be at approximately -35 ft MLLW. This translates into a requirement to demolish sheet piles approximately 82ft high from the -46-ft MLLW elevation to the top of the containment.

Demolition of the failed sheet pile structure would be accomplished through excavation and dredging of impounded soils (fill material), and cutting and removal of the existing sheet piles. Approximately 1,465,000 CY of material are planned to be removed as part of the NES1 Project. The material removed from excavation (115,000 CY) would be stockpiled in the North Expansion area for future use, while the dredged material (1,350,000 CY) would be disposed of offshore into the Anchorage Harbor Open Water Disposal Site, which is the authorized USACE offshore disposal area used by the POA under USACE permit POA-2003-00503-M20. The disposal area is located completely within the exemption to designated Cook Inlet beluga whale critical habitat.

The NES1 Project in-water work would begin with landside excavation and in-water dredging along the south shoreline and south half of the failed sheet pile structure. Any methodology considered for cutting and removing the steel sheet piles must account for worker safety, constructability, and minimization of potential acoustic impacts that the operation may have on marine mammals. The first attempt would be to extract the sheet piles with direct vertical pulling or with a vibratory hammer; however, there may be complications with the sheet pile interlocks, which can become seized, and other means of pile removal may be required. Demolition activities would begin with the south half of the existing structure, followed by the north half of NES1 (see Figure 6). The majority of the demolition work would occur from the water side to eliminate safety hazards from unexpected movements of fill material or the sheet piles themselves. The demolition plan also includes stabilization of the face sheets through installation of

temporary piles and dredging back into the cell to relieve pressure on the sheet piles and to eliminate any release of material into Cook Inlet beyond natural tidal forces.

Safety is a top priority regarding planning and executing the work. There are several risks to consider when planning demolition activities, such as strong currents and large tidal swings. Existing sheet piles and their interlocks are in poor condition. Many of the sheets may be damaged and bound up, making extraction difficult. There are stability concerns with the failed OCSP structure, where the POA will have to closely manage allowable fill differentials between adjacent cells and loading on the face sheets.

NES1 Project activities, locations, and quantities are summarized in Table 3.

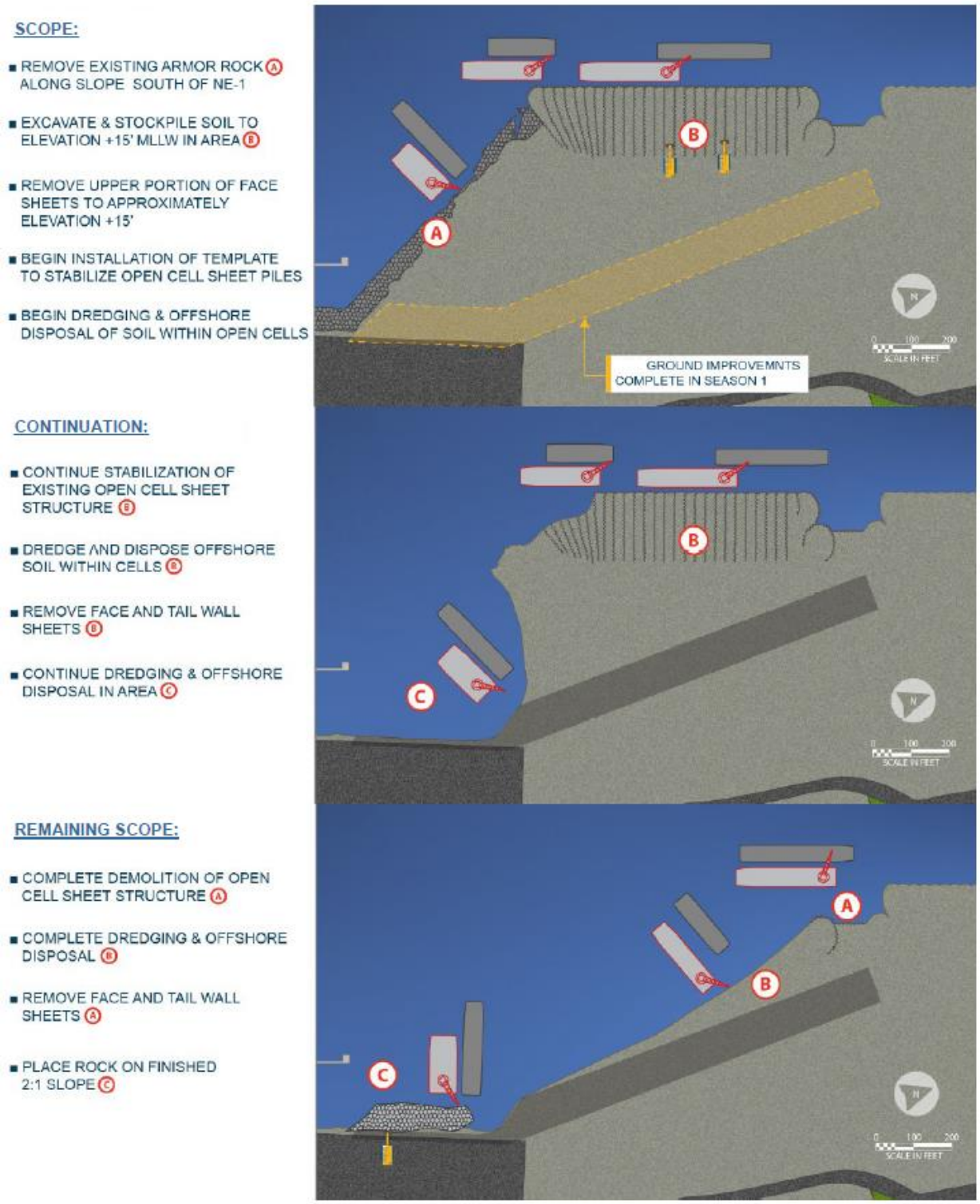


Figure 6. Example of the Contractor's Proposed Demolition Plan

Source: Manson Construction Company (Manson)

Table 3. Summary of NES1 Project Stages, Activities, Locations, and Approximate Quantities

Type of Activity	Location	Size and Type	Total Amount or Number
Excavation of fill material	On land	Granular fill and rock	115,000 CY
Dredging of fill material	In water	Granular fill	1,350,000 CY
At-sea transit and disposal of dredged fill	In water	Granular fill	1,350,000 CY
Cutting piles with sheet splitter (vertical)	In water or on land	19.69-in (50 cm) sheet piles, cut into vertical	Unknown[1]
Cutting piles with shears or torch (horizontal)[2]	In water	19.69-in (50 cm) sheet piles	Unknown[1]
Cutting piles with shears or torch (horizontal)	On land	19.69-in (50 cm) sheet piles	Unknown[1]
Vibratory or direct pull removal of sheet piles[3]	In water, on land	19.69-in (50 cm) sheet piles, removed in vertical panels	4,216 sheet piles
Installation and removal of temporary steel pipe piles	In water	81 24- or 36-inch	81 installations 81 removals
Slope construction	In water, on land	Bedding Filter rock Armor stone	60,500 CY

[1] The total number of sheet piles to be cut would be a subset of the estimated 4,216 sheet piles needed to be removed

[2] Deploying divers or underwater shear equipment would be the last resort for removing sheet piles

[3] Most of the waterside face and tailwall sheets would be cut in the dry to improve operational safety

Notes: cm = centimeter(s); CY = cubic yards.

Dredging and Disposal

Dredging would be performed with a derrick barge using a clamshell bucket (see Figure 7) and likely will take place for 24 hours per day for the duration of the project. One barge will perform the dredging associated with the sheet pile removal, working concurrently and in support of the crane barge removing the sheets. Another barge would perform dredging in the remaining Project area. This barge would start with removing the existing armor rock on the south slope and work its way north behind the OSCP bulkhead. Dredged material would be placed on a dump barge and taken by tug boat for disposal at the Anchorage Harbor Open Water Disposal Site.

Figure 7. Manson Derrick Barge VIKING Dredging near OSCP Bulkhead
Source: Manson

Dredging for NES1 will take place in an area that has been part of a working port for more than 50 years, where dredging activities are common. Take of marine mammals by dredging is not anticipated or proposed to be authorized due to the low intensity and stationary nature of the sounds produced by dredging and its perennial presence over many years in the same general location near the project site. Further, the sounds produced by dredging are not meaningfully different and are unlikely to exceed sounds produced by ongoing normal industrial activities at the port. Lastly, mitigation measures would be described in the Mitigation section of the FRN for the final IHA, if issued, and would ensure that direct physical interaction with marine mammals during dredging activities would be avoided. Therefore, dredging will not be considered further in this assessment.

Excavation

Landside excavation would occur with loaders and excavators to remove the top portion of fill material and open up work for initial sheet pile cutting and removal. This excavation would begin to relieve pressure along the sheet wall face and expose the tops of the sheet piles to mitigate the risk of damaging sheets while dredging with a clamshell bucket. The sheet piles can be more easily extracted if undamaged. The removal elevation will remain above +15 ft MLLW in order for the land equipment to reach the excavation depth with the groundwater and tidal elevations and ensure that the removed material will be in good condition. The material removed would be stockpiled at the POA for future use. Excavation would occur out of water and is not expected to result in take of marine mammals.

Pile Installation and Removal

The sheet pile removal process would begin with the installation of stability templates (steel pipe piles) along the face of the sheet pile structure, following excavation and initial dredging work. Once landside excavation has removed the top portion of fill along the face of the wall, the POA would use a barge to begin dredging the material within the cells while maintaining the allowable fill differential between adjacent cells to maintain structural integrity. Before dredging deeper than the allowable elevation determined by the engineer, a crane barge would install temporary stability templates along the face of the sheet pile structure. The addition of about 27 temporary stability template piles would support about one third of the bulkhead sheet pile wall during removal of the impounded material. These templates would reinforce the sheets as material is dredged, hold them upright to prohibit any sheet deformation, and improve the efficiency and effectiveness of extraction. The templates would also minimize the need to perform horizontal cuts at multiple elevations, including underwater. With strong currents and low visibility, performing horizontal cuts underwater poses significant challenges. After that area has been demolished, the temporary stability template piles would be removed and re-installed along the next third of the bulkhead. It is anticipated that three sets of 27 temporary piles will be required for a total of 81

installations and 81 removals (Table 3). Temporary piles would be installed and removed with a vibratory hammer.

Temporary stability template piles would be either 24- or 36-inch steel pipe piles. For the purposes of this EA, including potential marine mammal exposure (take) estimates, it is assumed that 24-inch piles would be used. If 36-inch piles are used for temporary stability template piles, it is assumed that the potential impacts of this alternate construction scenario and method on marine mammals are fungible; i.e., that potential impacts of installation and removal of 36-inch steel pipe piles would be similar to or less than the potential impacts of installation and removal of 24-inch steel pipe piles. Isopleths for both pile sizes have been calculated so that the relevant Level B harassment, Level A harassment, and shutdown zones are used by the marine mammal monitoring and mitigation program. See the IHA application, the proposed FRN (88 FR 76576, 6 November 2023), and the FRN for the final IHA, if issued, for details.

The POA would begin on the southern end of the sheet pile structure and work their way north along the sheet wall face, installing templates and dredging fill material while managing fill elevations from cell to cell (Figure 8). Fill material would slide down into the dredge area and would continue to be removed until a cell has been dredged down to -40 ft MLLW adjacent to the face sheets and all pressure of the fill material on the face has been relieved. At this stage, the crane barge can begin removing the sheet piles, starting with the face sheets.

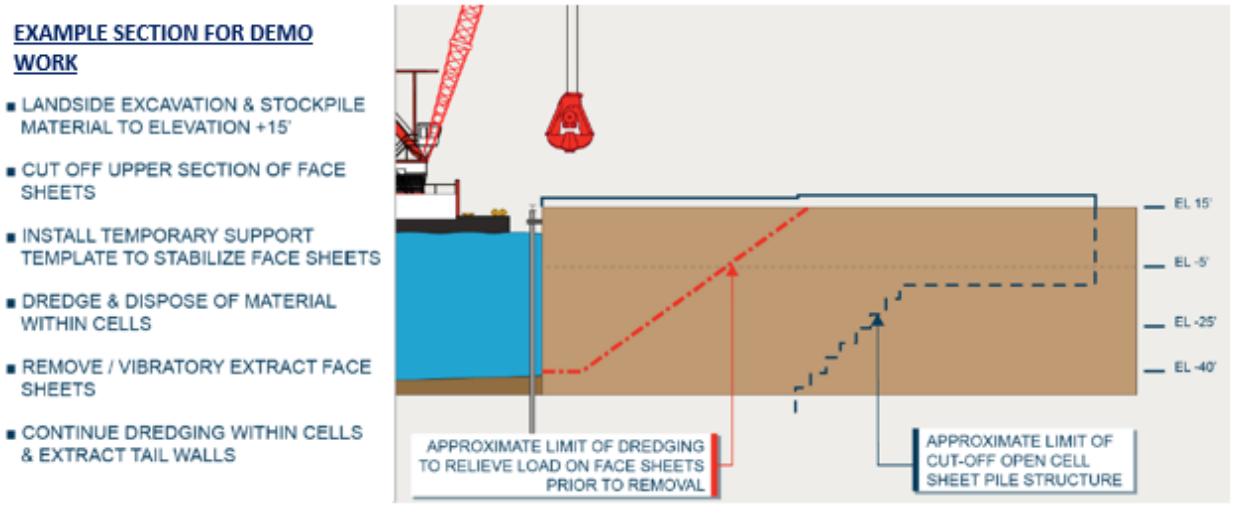


Figure 8. Example Section for Contractor's Proposed Demolition Work
Source: Manson

Some sheet piles from the tailwalls would be removed in the dry, potentially during excavation, depending on construction sequencing and tide heights. To minimize potential impacts on marine mammals from in-water sheet pile removal with a vibratory hammer, removal in the dry would be maximized as feasible; however, until work commences, the exact number of sheet piles that may be removed in the dry is unknown. It is estimated that approximately 20 to 30 percent of sheet piles would be removed in the dry.

Additionally, it is possible that some sheet piles may not require vibratory removal and may be removed by direct pulling. Once fill material and impounded soils have been excavated or dredged from both sides of the sheet piles, it may be adequate to dislodge the sheet piles out of interlock by lifting or direct pulling.

Although some sheet piles and sheet pile sections would be removed by direct pulling and/or in the dry, it is anticipated that some sheet piles and sheet pile sections would need to be removed with a vibratory

hammer in water. Sheet piles may not be extracted easily if soil adheres to them along the embedded length. It is also possible that competent portions of the interlocks will resist movement, or that interlocks that are bent or damaged by shearing will be difficult to separate and require shaking with a vibratory hammer. Removal of sheet piles in water with a vibratory hammer or use of a splitter with a vibratory hammer would impart sound energy into the water that could rise to the level of harassment to marine mammals.

During vibratory removal, a vibratory hammer would be suspended from a crane and connected to a powerpack. The extractor jaw would be hydraulically locked onto the web of the sheet pile (i.e., the thin, flat part between the interlocks). The pile will be vibrated as upward vertical force is applied to extract it. Ideally, the piles would slide within the interlock, separating them from the adjacent piles. This may not always be the case, as the pile may bind, and multiple piles may be dislodged from the original installed position. Another potential outcome of a pile that binds up is that the pile web may be compromised from corrosion or other damage, resulting in the web steel tearing and partially ripping the pile, necessitating the application of vertical force to a neighboring pile.

Vertical cuts to split the sheet piles into panels will be made if the interlocks will not release. The specific tools that would be used for pile splitting are not known, but it is anticipated that a pile splitter would be used (Figure 9). A pile splitter is a stiffened steel H-beam with some of the webbing removed. The edges of the H-beam webbing are hardened and form a large wedge between the flanges. The wedge is set on top of the sheet pile webbing where a cut is required. The splitter is then driven with a hammer down the webbing of the sheet pile until the tip of the H-beam passes the tip of the sheets, cutting the sheet pile all the way through and separating it into two parts. Multiple cuts split the sheet pile wall into tall vertical panels that can be removed in smaller pieces. Cuts in the sheet piles may be spaced 4 to 6 sheets apart and multiple sheets or pieces would be removed together. Splitters can be used in the air, water, or in soils and can be driven with impact or vibratory hammers. The splitter would be used in conjunction with a vibratory hammer, and use of the splitter or removal of sheet piles with a vibratory hammer is assumed to produce the same or similar sound levels. Therefore, for time estimation (Table 4) and for take calculations (Section 4.6.2.3), use of a vibratory hammer to remove sheet pile and use of a splitter are combined into a single category and treated identically.

Figure 9. Example of H-beam Sheet Splitter

Source: Manson

Table 4. Pile Installation and Removal Methods and Estimated Durations

Pile Type	Pile Size	Structural Feature	Total Number of Piles	Piles in the Dry	Piles in Water	Average Vibratory and/or Splitter Duration	Maximum Impact Strikes Per Day	Total Duration of Removal & Installation in Water	Average Production Rate, Piles Per Day (Range)	Number of Days
PS 27.5 and PS 31 Sheets	19.69 inches (50 cm)	Tailwalls	3,536	1,269	2,267	2.0 hours/day	150	157 hours	50 (10 to 100)	46
PS 27.5 and PS 31 Sheets	19.69 inches (50 cm)	Cell Faces (Bulkhead)	568	0	568	2.0 hours/day	150	41 hours	30 (10 to 60)	19
PZC2 6 Sheets	27.88 inches (70 cm)	Closure Walls	112	0	112	2.0 hours/day	150	8 hours	50 (10 to 100)	3
Steel Pipe	24- or 36-inch install	Temporary Stability Templates	81	0	81	15 min/pile	0	20.25 hours	4 (2 to 12)	21
Steel Pipe	24- or 36-inch removal	Temporary Stability Templates	81	0	81	15 min/pile	0	20.25 hours	4 (2 to 12)	21
Total	—	—	—	—	—	—	—	**246.5 hours**	—	**110**

Note: cm = centimeter(s); min = minutes

The POA estimates that an average of approximately 5 minutes of vibratory hammer application would be required to remove sheet pile sections (Table 4). The POA would not use two vibratory hammers with or without splitters simultaneously. It is unknown how many sheet piles may be included in a section; it is anticipated that this number will vary widely. If sheet piles remain seized in the sediments and cannot be loosened or broken free with a vibratory hammer, they may be dislodged with an impact hammer. Impact removal is the process of hitting a pile with an impact hammer with a small number of strikes (up to 50 per pile) to loosen it from the soil so that it can be removed via other means such as direct pulling or with a vibratory hammer. Use of an impact hammer to dislodge sheet piles is expected to be uncommon, with up to 150 strikes (an estimated 50 strikes per pile for up to 3 piles) on any individual day or approximately 5 percent of active hammer duration for each sheet pile.

Some alternative means of pile removal include dredging or excavation to reduce further pile embedment, and cutting sheet piles using hydraulic shears or underwater ultrathermic cutting. When feasible, sheet piles would be removed in one piece, without cutting. Similarly, use of cutting methods to cut piles into sections that could be more easily removed would take place out of water when feasible. The POA anticipates that hydraulic shears may be used to cut sheet piles both in and out of water (Figure 10). It is anticipated that hydraulic shears would be able to cut sheet piles along their width, including the thumb-finger interlock joints (Figure 4) and the wye joints (Figure 5).The POA anticipates that sounds produced by hydraulic shears would be brief, low level, and intermittent, imparting minimal sound energy into the water column. A single closure of the shears on sheet pile is anticipated to successfully sever one or multiple sheets depending on the model and jaw depth. The POA anticipates that a single cut may require up to 2 minutes for the shears to close, although the duration of a single cut is likely to be less than 2 minutes. Therefore, take of marine mammals associated with hydraulic shearing is not anticipated or authorized.

Figure 10. Example of Type of Hydraulic Shears That May Be Used to Cut Sheet Piles
Source: Genesis Inc.

Underwater ultrathermic cutting is performed by commercial divers using hand-held equipment to cut or melt through ferrous and non-ferrous metals, and could be used to cut the zinc-coated OCSP structure. These systems operate through a torch-like process, initiated by applying a melting amperage to a steel tube packed with alloy steel rods, sometimes mixed with aluminum rods to increase the heat output. In the hands of skilled commercial divers, underwater ultrathermic cutting is reputed to be relatively fast and efficient, cutting through approximately 2 to 4 inches (5 to 10 cm) per minute, depending upon the number of divers deployed. This efficacy may be constrained by the requirement to secure the severed piles from falling into the inlet to prevent an extreme hazard to the diver cutting the piles. Tidally driven currents in Cook Inlet may limit dive times to approximately 2 to 3 hours per high- and low-tide event, depending upon the tide cycle and the ability of divers to efficiently perform the cutting task while holding position during high current periods. Take of marine mammals associated with underwater ultrathermic cutting is not anticipated or authorized as this activity is not considered to produce sound.

Once the face sheets have been removed, the crane barge can remove the stability templates for use on other cells. When the face sheets are removed, the tail-walls become independent walls with only fill material between them. The crane barge will work to extract as many tail-wall sheets as it can until additional relief dredging is required to allow for vibratory extraction. At this point, the crane barge would continue northward while the dredge rig falls back to continue dredging between the sheets. The POA would continue to remove the face wall and tail-wall sheets from south to north until the OCSP structure has been removed.

A key consideration is to avoid rapid release of the impounded soils into Cook Inlet. This is an important safety issue that presents a risk to constructor personnel working in or near the cells in the immediate area of such an event. It is also an important operational issue to the POA, as releasing large quantities of materials into the Inlet could quickly foul the adjoining cargo terminal berths (Figure 11).

Figure 11. Subsidence of Impounded Materials at the Face Wall (Bulkhead) Illustrating Material Loss Through the Face Sheet Interlocks

To avoid rapid release of the impounded soils, the demolition would need to be managed to account for the soil pressure of the adjacent adjoining cells. Failure to properly manage this process would likely result in the earth pressure generated by adjacent adjoining cells exerting lateral forces that would cause catastrophic tailwall failures. Also, the sheets joined in interlock are susceptible to bending in the weak axis, which could result in rotational forces that may overcome the vertical interlocks, causing the interlocks to unzip, again resulting in catastrophic tailwall failures and or face wall failures. Qualified professional engineers on the Design/Build Team would develop Construction Work Plans with the specific details to ameliorate these risks.

The sheet pile interlocks do not prevent the flow of seawater into soils impounded within the OCSP cells. The water infiltration is most prevalent at the face sheets; however, dynamic wave forces, the variable sea level height of Cook Inlet, and variations in the impounded soils and associated permeability make the interface elevation between unsaturated and saturated soils dynamic. Because saturated soils cannot resist shear, land-based excavation can be safely accomplished at a height above the saturated soil depth to be determined by the Design Build Team designer of record (DOR), in case the equipment weight exceeds the soil-bearing capacity.

Shoreline Stabilization

After the existing sheet pile structure has been removed, the sloped shoreline would be secured with armor stone placed on a layer of filter rock and granular fill. Placement of armor rock requires good visibility of the shore as each rock is placed carefully to interlock with surrounding armor rock. It is therefore anticipated that placement of armor rock would occur in the dry at low tide levels when feasible; however, some placement of armor rock, filter rock, and granular fill will occur in water. No impacts on marine mammals from placement of armor rock, filter rock, and granular fill in the dry are anticipated. Elevated sound levels from in-water placement of fill and armor rock are not anticipated.

2.2.3 Applicant's Required Avoidance and Minimization Measures

In their 31 August 2023 IHA application, the POA identified several avoidance and minimization measures as components of the Proposed Action and requirements of contractors during NES1 construction to eliminate the potential for injury and to minimize disturbance harassment of marine mammals. NMFS would also require additional measures that will be outlined in the final IHA, if issued.

The avoidance, minimization, and mitigation measures proposed by the POA and NMFS and would be required for the NES1 Project are identified below.

2.2.3.1 Monitoring and Reporting

Marine mammal monitoring by qualified, NMFS approved, PSOs would be conducted at the POA at all times when in-water pile installation or removal is taking place (POA 2022b). Additionally, PSOs will be on site monitoring for marine mammals during in-water cutting of sheet piles with shears or an ultrathermic torch.

The POA, through its Construction Contractor and PSOs, would collect electronic data on marine mammal sightings and any behavioral responses to in-water pile installation and removal associated with the NES1 Project. At least two PSO teams at a minimum of two locations will work concurrently to provide full coverage for marine mammal monitoring in rotating shifts during in-water pile installation and removal. All PSOs would be trained in marine mammal identification and behaviors. The PSOs would monitor for marine mammals in applicable harassment zones during in-water pile installation and removal, and collaborate to communicate the presence of marine mammals to the POA.

The marine mammal monitoring and mitigation program that is planned for NES1 would be similar to that used for construction of the POA's PCT and SFD, which are recently completed pile driving construction projects that required NMFS authorization (6 April 2020, 85 FR 19294; 7 September 2021, 86 FR 50057). For the PCT and SFD, the POA and NMFS were able to identify exact monitoring locations at the time of issuance of the IHA. NES1, however, involves demolition of the North Extension, and concerns about the stability of that area preclude determination of the exact monitoring locations until the Construction Contractor develops their Construction Work Plan. PSOs would be positioned at the best practical vantage points that are determined to be safe.

PSOs would monitor for marine mammals from a minimum of two PSO stations. It is anticipated that PSO stations would be located where the Level B harassment shutdown zones for beluga whales can be effectively monitored. Likely locations include the Anchorage Public Boat Dock at Ship Creek to the south of the Project site, and a location to the north of the Project site, such as the northern end of POA property near Cairn Point or at Port MacKenzie, across Knik Arm. At least one of the PSO stations must be able to observe the shutdown zones. Each PSO station would have at least two PSOs. See the Marine Mammal Monitoring and Mitigation Plan 2022 (POA 2022b) for additional details.

The POA would receive a daily monitoring summary from its Construction Contractor that would include a summary of marine mammal sightings and potential exposures (takes). The POA would provide weekly and monthly monitoring reports to NMFS during the NES1 Project construction season. These reports would include a summary of marine mammal species and behavioral observations, pile driving shutdowns or delays, and pile driving work completed. The reports also must include an assessment of the amount of construction remaining to be completed (i.e., the number of estimated hours of work remaining), in addition to the number of beluga whales observed within estimated harassment zones to date.

The POA would provide a draft summary marine mammal monitoring report and copy of the final data set to the USACE and NMFS within 90 days of completion of the marine mammal monitoring or 60 days prior to the requested issuance of any subsequent IHA for construction activity at the same location, whichever comes first. The summary report would include information on the monitoring efforts, a summary of environmental conditions, details of marine mammal sightings and behavior, in-water activities before and after each sighting, and a summary of Project shutdowns.

2.2.3.2 Mitigation Measures

Mitigation measures proposed by the POA include the following, modeled after the stipulations outlined in the Final IHAs for PCT Phase 1 and Phase 2 construction (85 FR 19294), SFD construction (86 FR 50057), and Section 11 of the NES1 Project IHA application:

- The POA would ensure that construction supervisors and crews, the monitoring team, and relevant POA staff are trained prior to the start of all pile driving, so that responsibilities, communication procedures, monitoring protocols, and operational procedures are clearly understood. New personnel joining during the project must be trained prior to commencing work;
- Employ PSOs and establish monitoring locations as described in the POA's Marine Mammal Monitoring and Mitigation Plan (POA 2022b). The POA must monitor the project area to the maximum extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions;
- Marine mammal monitoring will take place from 30 minutes prior to initiation of in-water pile installation and removal through 30 minutes post-completion of pile installation and removal;
- Pre-start clearance monitoring must be conducted during periods of visibility sufficient for the lead PSO to determine that the shutdown zones indicated in Table 5 are clear of marine mammals. Pile driving may commence following 30 minutes of observation when the determination is made that the shutdown zones are clear of marine mammals or when the mitigation measures proposed specifically for beluga whales (below) are satisfied;
- For all construction activities, shutdown zones must be established following Table 5. The purpose of a shutdown zone is generally to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). In addition to the shutdown zones specified in Table 5, the POA plans to implement a minimum 100-meter (m) shutdown zone around the active NES1 project work site, including around activities other than pile installation or removal that NMFS has determined do not present a reasonable potential to cause take of marine mammals. Shutdown zones for pile installation and removal would vary based on the type of construction activity and by marine mammal hearing group. Here, shutdown zones are larger than or equivalent to the estimated Level A harassment isopleths shown in Table 5 for species other than beluga whales and are equal to the estimated Level B harassment isopleths for beluga whales;

Table 5. Proposed Shutdown Zones during NES1 Project Activities

Activity	Pile Type / Size	Shutdown Zone (m)					
		LF cetaceans	Non-beluga MF cetaceans	belugas	HF cetaceans	PW	OW
Impact Removal	Sheet pile	160	10	900	190	90	10
Vibratory Installation	24-inch (61-cm)	20	10	2,300	20	10	10
	36-inch (91-cm)	30	10	4,600	40	20	10
Vibratory Removal	Sheet pile	10	10	2,000	20	10	10
	24-inch (61-cm)	50	10	6,900	60	30	10
	36-inch (91-cm)	20	10	1,700	20	10	10
Notes: cm = centimeter(s), m = meter(s)							

- Marine mammals observed anywhere within visual range of the PSO must be tracked relative to construction activities. If a marine mammal is observed entering or within the shutdown zones

indicated in Table 5, pile driving must be delayed or halted. If pile driving is delayed or halted due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily exited and been visually confirmed beyond the shutdown zone (Table 5), or 15 minutes (non-beluga whales) or 30 minutes (beluga whales) have passed without re-detection of the animal;

- The POA must use soft start techniques when impact pile driving. Soft start requires contractors to provide an initial set of three strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced energy strike sets. A soft start must be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer. PSOs shall begin observing for marine mammals 30 minutes before "soft start" or in-water pile installation or removal begins;
- Pile driving activity must be halted upon observation of either a species for which incidental take is not authorized or a species for which incidental take has been authorized but the authorized number of takes has been met, entering or within the harassment zone; and
- The POA must avoid direct physical interaction with marine mammals during construction activities. If a marine mammal comes within 10 m of such activity, operations shall cease. Should a marine mammal come within 10 m of a vessel in transit, the boat operator would reduce vessel speed to the minimum level required to maintain steerage and safe working conditions. If human safety is at risk, the in-water activity would be allowed to continue until it is safe to stop;
- The following additional mitigation measures are proposed by NMFS for beluga whales:
  - The POA must make all practicable efforts to complete construction activities between April and July, when beluga whales are typically found in lower numbers near the proposed site;
  - Prior to the onset of pile driving, should a beluga whale be observed approaching the estimated Level B harassment zone, pile driving will be delayed. Pile driving may commence once the whale(s) moves at least 100 m past the Level B harassment zone and on a path away from the zone, or the whale has not been re-sighted within 30 minutes;
  - If pile installation or removal has commenced, and a beluga whale(s) is observed within or likely to enter the Level B harassment zone, pile installation or removal will shut down and not re-commence until the whale has traveled at least 100 m beyond the Level B harassment zone and is on a path away from such zone or until no beluga whale has been observed in the Level B harassment zone for 30 minutes; and
  - If during installation and removal of piles, PSOs can no longer effectively monitor the entirety of the beluga whale Level B harassment zone due to environmental conditions (e.g., fog, rain, wind), pile driving may continue only until the current segment of the pile is driven; no additional sections of pile or additional piles may be driven until conditions improve such that the Level B harassment zone can be effectively monitored. If the Level B harassment zone cannot be monitored for more than 15 minutes, the entire Level B harassment zone will be cleared again for 30 minutes prior to pile driving.

In addition to these mitigation measures, the POA and NMFS considered practicable work restrictions. Given the nature of this project and the required sequencing structure of the construction schedule the POA cannot commit to restricting pile driving to April to July, when beluga whales are typically found in lower numbers. NMFS is requiring as a mitigation measure that the POA would complete as much work as possible in April to July to reduce the number of piles that may need to be installed in August and September. However, the POA cannot commit to effort restrictions during those months.

For previous IHAs at the POA (PCT, April 6, 2020, 85 FR 19294; SFD, September 7, 2021, 86 FR 50057), the use of a bubble curtain to reduce noise has been required as a mitigation measure for certain pile driving scenarios. The POA did not propose to use a bubble curtain system during the NES1 project, stating that it is not a practicable mitigation measure for this demolition project. NMFS concurs with this determination. Practicability concerns include the following:

- NES1 construction activities include installation of round, temporary, stability template piles to shore up the filled NES1 structure while fill material and sheet piles are removed. Stability template piles that would be required for demolition of the sheet pile structure are located in proximity of the sheet piles. A bubble curtain would not physically fit between the sheet piles and the template piles;
- Bubble curtains could not be installed around the sheet pile as they are removed because the structure consists of sheet piles that are connected to one another and used to support fill-material. It would not be possible to place a bubble curtain system along the sheet pile face for similar reasons, including lack of space for the bubble curtain and the structures and equipment that would be needed to install and operate it, and the high likelihood that it could not function or be retrieved; and
- NES1 is a failed structure, which has been deemed "globally unstable" and poses significant risk for continued deterioration and structural collapse. If the existing structure were to collapse during deconstruction and sheet pile removal, there is risk of a significant release of impounded fill material into Cook Inlet beluga whale habitat, the POA's vessel operating and mooring areas, and the USACE Anchorage Harbor Project. Due to the stability risk of the existing impounded material, it is expected that construction and demolition means and methods would be highly adaptive once actual field work commences, and use of a bubble curtain with deconstruction would limit operations in the field and create significant health and safety issues.

The POA also has efficacy concerns about requiring a bubble curtain for NES1 construction activities. Adding a requirement for a bubble curtain may hinder production, due to the time required to install and remove the bubble curtain itself. This has the potential to drive the in-water construction schedule further into the late summer months, which are known for higher beluga whale abundance in lower Knik Arm, thus lengthening the duration of potential interactions between beluga whales and in-water works. Therefore, NMFS is concerned that use of a bubble curtain may not be an effective measure, given the potential that bubble curtain use could ultimately result in increased impacts to beluga whales, in addition to the aforementioned practicability issues.

2.3 Alternative 1 - No Action Alternative

In accordance with NOAA's implementing regulations, the Companion Manual (CM) for NAO 216-6A, Section 6.B.i, NMFS is defining the No Action Alternative as not issuing the requested IHA under Section 101(a)(5)(D) of the MMPA. This is consistent with the NMFS statutory obligation under the MMPA to either (1) deny the requested authorization, or (2) grant the requested authorization and prescribe mitigation, monitoring, and reporting requirements. Thus, under the No Action Alternative, NMFS assumes that the POA would not proceed with their proposed NES1 Project construction as described in the application. Although the No Action Alternative would not meet the purpose and need to allow incidental takes of small numbers of marine mammals under certain conditions (i.e., when the statutory requirements are satisfied), the 2022 revised CEQ regulations require consideration and analysis of a No Action Alternative for the purposes of presenting a comparative analysis to the action alternatives. The No Action Alternative, consistent with 2022 revised CEQ regulations and the CM, serves as a baseline against which the impacts of the Preferred Alternative are compared and contrasted.

2.4 Alternative 2 - Issuance of Requested IHA (Preferred Alternative)

Under Alternative 2, the Preferred Alternative, NMFS would issue the requested IHA to the POA allowing the take, by Level B harassment of seven species of marine mammals and Level A harassment

of two of those seven species, incidental to pile installation and removal associated with the construction of the NES1 (see Section 2.2), subject to the mitigation measures, monitoring, and reporting requirements set forth in the IHA, if issued. This alternative also includes mandatory requirements for the POA to achieve the MMPA standard of effecting the least practicable adverse impact on the species or stocks of marine mammals and their habitat, paying particular attention to rookeries, mating grounds, and other areas of similar significance and not having an unmitigable adverse impact on the availability of marine mammals for subsistence use.

2.5 Alternatives Considered but Eliminated from Further Consideration

In coordination with the POA, NMFS considered whether other alternatives could meet the purpose of and need for the project while supporting the POA's proposal to construct the NES1 Project. No other action alternative met the purpose of and need for this project; therefore, no other alternatives were considered.

Chapter 3 Affected Environment

NMFS considered all relevant environmental, cultural, historical, social, and economic resources based on the geographic location associated with NMFS' Proposed Action, alternatives, and the POA's request for an IHA. Based on this review, this chapter describes the affected environment, existing (baseline) conditions for select resource categories (e.g., marine environment), and reasonably foreseeable environmental trends. As explained in Section 1.6, certain resource categories were not carried forward for further consideration or evaluation in this EA (see Table 1 in Section 1.6).

3.1 Physical Environment

Cook Inlet is a large tidal estuary that exchanges waters at its mouth with the Gulf of Alaska. Cook Inlet is roughly 20,000 square kilometers (km^2; 7,700 square miles [mi^2]) in area, with approximately 1,350 linear km (840 mi) of coastline (Rugh et al. 2000) and an average depth of approximately 100 m (330 ft). Cook Inlet is generally divided into upper and lower regions by the East and West Forelands. Northern Cook Inlet bifurcates into Knik Arm to the north and Turnagain Arm to the east. The POA is located in Anchorage, Alaska, along the southeastern shoreline of Knik Arm in upper Cook Inlet.

The POA's boundaries currently occupy an area of approximately 129 acres. Other commercial and industrial activities related to secure maritime operations are located near the POA on Alaska Railroad Corporation property immediately south of the POA, on approximately 111 acres.

3.1.1 Ambient Sound/Acoustical Environment

In Knik Arm, marine mammals are exposed to natural and anthropogenic sounds. Though much of upper Cook Inlet is a poor environment for acoustic propagation, characterized by shallow depth, sand/mud bottoms, and high background noise from currents and glacial silt (Blackwell and Greene 2002), vessel use and in-water construction have affected baseline acoustic conditions for marine mammals.

Background noise in Knik Arm results from many sources including from dredging operations, boats, ships, oil and gas operations, construction noise, and aircraft overflights from JBER and Ted Stevens International Airport (see Section 4.8.5 for additional sources of noise in Knik Arm). The lower range of broadband (10 to 10,000 Hertz [Hz]) background sound levels obtained during underwater measurements at Port MacKenzie, located across Knik Arm from the POA, ranged from 115 to 133 decibels (dB) root mean square (RMS) referenced to 1 microPascal (dB re 1 µPa; Blackwell 2005). All underwater sound levels in this EA are referenced to dB re 1 µPa. Background sound levels measured during the 2007 test pile study for the POA's Marine Terminal Redevelopment Project (MTRP) site ranged from 105 to 135 dB (URS 2007). The background sound pressure levels (SPLs) obtained during that study were highly variable, with most SPL recordings exceeding 120 dB RMS. Background sound levels measured in 2008 at the MTRP site ranged from 120 to 150 dB RMS (Scientific Fishery Systems, Inc. 2009). These measurements included industrial sounds from maritime operations; ongoing USACE maintenance dredging and pile driving from construction were not underway at the time of the study.

The most recent measurements of background sound levels at the POA are from the 2016 Test Pile Program (TPP) (Austin et al. 2016), in which background sound recordings were measured at two locations during a 3-day break in pile installation activities. Median background noise levels, measured at a location just offshore of the POA and at a second location approximately 1 km (0.6 mi) offshore, were 117 and 122.2 dB RMS re 1 µPa, respectively. NMFS accepted 122.2 dB RMS as the background noise level for Phases 1 and 2 of the POA PCT Project (85 FR 19294) and for the POA SFD Project (86 FR 50057). Based on these measurements, the noise level of 122.2 dB RMS will be used for the NES1 Project. Ambient noise levels were not measured as part of the acoustic monitoring program during June 2020 or 2021 (I&R et al. 2021a, 2021b).

3.2 Biological Environment

The primary component of the biological environment that would be affected by the Proposed Action and alternatives is marine mammals, which would be directly affected by the authorization of incidental take.

3.2.1 History of Incidental Take Authorized at the POA

The environmental baseline for the biological environment for the proposed action includes the effects of previously authorized take of marine mammals, including recent authorizations for POA construction beginning in 2008. For more background on the POA's development history and analysis of cumulative impact for future activities, see section 4.8.5.2. The POA (i.e., Port of Anchorage at that time) Expansion Project included pile installation (including sheet and 36-inch round piles) and dredging between 2008 and 2011. The Cook Inlet beluga whale was listed under the ESA in October 2008; therefore, ESA Section 7 consultation covered work from 2009 through 2011. The number of beluga whales potentially harassed, as defined under the MMPA, was fewer than the number of takes authorized. NMFS Permits Division authorized 34 takes of beluga whales per year of the project (there was no take issued for humpback whales or Steller sea lions). Takes of other marine mammal species were also limited. Scientific monitoring during that period showed that beluga whales continued to transit past the POA, and their passage to critical foraging grounds in upper Knik Arm was not blocked or impeded.

In 2016, NMFS issued a Section 7 BiOp for the POA's TPP to evaluate sound attenuation devices for potential use during port expansion projects. The NMFS Permits Division authorized Level B harassment takes for 26 Cook Inlet beluga whales and 6 Western DPS Steller sea lions. During the project, beluga whales entered the Level B harassment exclusion zone on nine occasions. Only one 4-minute delay of start of operations was necessitated to avoid prohibited takes of beluga whales, and one authorized instance of potential Level B harassment occurred, affecting a single beluga whale (Cornick and Seagars 2016).

In 2018, NMFS issued a Letter of Concurrence (LOC) for ESA Section 7 consultation for the POA Fender Pile and Replacement Repair Project (NMFS 2018b). This project included pile installation of forty-four 22-inch round piles. Mitigation measures were implemented to avoid take of marine mammals; therefore, no take was authorized. No sightings of protected species occurred during pile installation activities. However, on 30 May 2019, a small group of beluga whales was observed by the construction crew before in-water work began. When the PSO arrived, they observed three adult beluga whales traveling northward and milling.

On 23 March 2020, NMFS issued a BiOp and ITS (NMFS 2020a) that consulted on the effects of the POA PCT Project (Phases 1 and 2) on the western DPS of Steller sea lions, humpback whales, and Cook Inlet beluga whales and their designated or proposed critical habitat. On 31 March 2020, NMFS issued two successive IHAs (85 FR 19294; NMFS 2020b, 2020c) to the POA for construction of the PCT. Construction of the PCT was planned and permitted as two distinct construction seasons, with PCT Phase 1 permitted under an IHA valid from 1 April 2020 through 31 March 2021 (NMFS 2020b), and work on PCT Phase 2 permitted under the successive IHA valid from 1 April 2021 through 31 March 2022 (NMFS 2020c). The PCT requested two modifications to the PCT Phase 2 IHA, and NMFS approved that process. The modifications to construction methods were necessary to ensure safe, accurate, and efficient construction of the PCT facility, and led to other changes that reduced potential impacts to marine mammals, including a reduction in temporary pile numbers, avoidance of battered piles, and a reduction in overall installation and removal times, which together achieved the least practicable adverse impact on marine mammals. PCT in-water construction was completed in 2021 and the terminal was completed in 2022. Take by Level A harassment was authorized for three species in PCT Phase 1 and 4 species in PCT Phase 2, while take by Level B harassment was authorized for six species during both Phases.

In 2020, the POA applied for concurrence from the USACE that the POA Fender Pile Replacement and Repair Project qualifies under Nationwide Permit 3, Maintenance. Informal Section 7 consultation for this work was initiated on 25 September 2020 (POA 2020). The purpose of the project was to replace 180 corroding and failing 22-inch pin piles within the POA's existing fendering system. Pre- and post-earthquake (2018) inspections have shown that these pin piles were in a state of imminent failure and require emergency repair. It was determined through engineering evaluation that these piles were providing only 10 percent of the required resistance for safely berthing ships at the POA, presenting a substantial safety hazard and potential threat to commerce in Alaska. The fendering system is comprised of 107 fender assemblies, each supported by two pin piles. A total of 23 fender assemblies were replaced in 2015 and 2019. The POA has repaired the remaining fender assemblies except for one fender, which is expected to be completed in 2023.

To reinforce each fender assembly, a 22-inch pile was installed inside each existing 24-inch pile up to a 45-foot embedment depth using an impact and/or vibratory hammer. Installing the new pile within the existing pile reduced noise impacts and the potential for incidental dock damage during maintenance. For piles that were determined to be in extremely poor condition or that had already failed, a diving contractor cut the pile off at the mudline and removed the non-embedded portion of the pile. In-water work included pile installation and fender repair within previously disturbed areas; no excavation or fill was associated with this project. The POA implemented mitigation and monitoring measures (shutdown zones and PSO monitoring). This project did not result in the harassment of marine mammals; therefore, no MMPA authorization was necessary.

In 2021, NMFS issued an IHA for construction of the SFD. Take by Level B harassment of six marine mammal species and take by Level A harassment of two of those six species was authorized in the IHA. Construction of the SFD was completed in 2022.

These projects had only a temporary effect on marine mammal habitat. In addition they only resulted in short-term behavioral effects for most individuals impacted, permanent threshold shifts (PTS) in a few non-beluga species, and they had no known long-term effects on marine mammal populations. These previously authorized takes would not have aggregate effects when combined with the proposed takes authorized for the NES1 project because the previous and proposed takes are limited to temporary Level B harassment.

3.2.2 Marine Mammal Habitat

The mouths of rivers, such as those near the POA, are important beluga whale feeding habitat. Harbor seals (*Phoca vitulina*) use coastal haulouts in upper Cook Inlet, including mud flats near river mouths. Harbor seals are not known to haul out near the POA; however, they are frequently seen foraging near the mouth of Ship Creek (Cornick et al. 2011; Shelden et al. 2013; 61N Environmental 2021, 2022a). Small numbers of harbor porpoises (*Phocoena phocoena*) have been consistently reported in upper Cook Inlet between April and October (Shelden et al. 2014). During POA construction during 2005 through 2011, 2016, and 2020 through 2022, harbor porpoises were reported in the port vicinity (Prevel-Ramos et al. 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick et al. 2010, 2011; Cornick and Seagars 2016; POA 2021: Table 4-2; 61N Environmental 2021, 2022a, 2022b, 2022c). Other species that may be encountered infrequently or rarely in the Project area include killer whales (*Orcinus orca*), gray whales, humpback whales, and Steller sea lions. Killer whales have been documented preying on beluga whales in upper Cook Inlet; however, they have not been observed during POA construction or scientific monitoring. Steller sea lions were observed during construction or dredging activities near the POA in 2009, 2016, and 2019 through 2022 (ICRC 2009; Cornick and Seagars 2016; 61N Environmental 2021, 2022a, 2022b, 2022c).

Pursuant to the ESA, critical habitat has been designated for Cook Inlet beluga whales (76 FR 20180, 11 April 11) (Figure 12). The beluga whale is the only ESA-listed marine mammal entity in the vicinity of

the project area that has critical habitat designated in Cook Inlet.[13] Cook Inlet beluga whale critical habitat includes portions of Knik Arm. Area 1 of the Cook Inlet beluga whales' critical habitat encompasses all marine waters of Cook Inlet north of a line connecting Point Possession (61.04° North, 150.37° West) and the mouth of Three Mile Creek (61.08.55° North, 151.04.40° West), including waters of the Susitna, Little Susitna, and Chickaloon rivers below mean higher-high water (MHHW). This area provides important habitat during ice-free months and is used intensively by beluga whales between April and November (NMFS 2016b). Area 2, located south of Area 1, includes nearshore areas south of 60° 25.0' North along the west side of the Inlet and Kachemak Bay, on the east side of lower Cook Inlet (74 FR 63080). More information regarding Cook Inlet beluga whale critical habitat can be found on NOAA's website[14] and in 76 FR 20180.

The area surrounding the POA was excluded from the Cook Inlet beluga whale critical habitat designation for national security reasons (76 FR 20180). Although the immediate area around the POA is excluded from designated critical habitat, underwater noise from installation and removal of stability template steel pipe piles and removal of sheet piles may be perceptible to beluga whales within designated critical habitat beyond the exclusion zone for some installation and removal methods and pile sizes.

[13] Critical habitat for Steller sea lions and humpback whales does not occur near the NES1 Project area or in upper Cook Inlet.

[14] https://www.fisheries.noaa.gov/action/critical-habitat-cook-inlet-beluga-whale

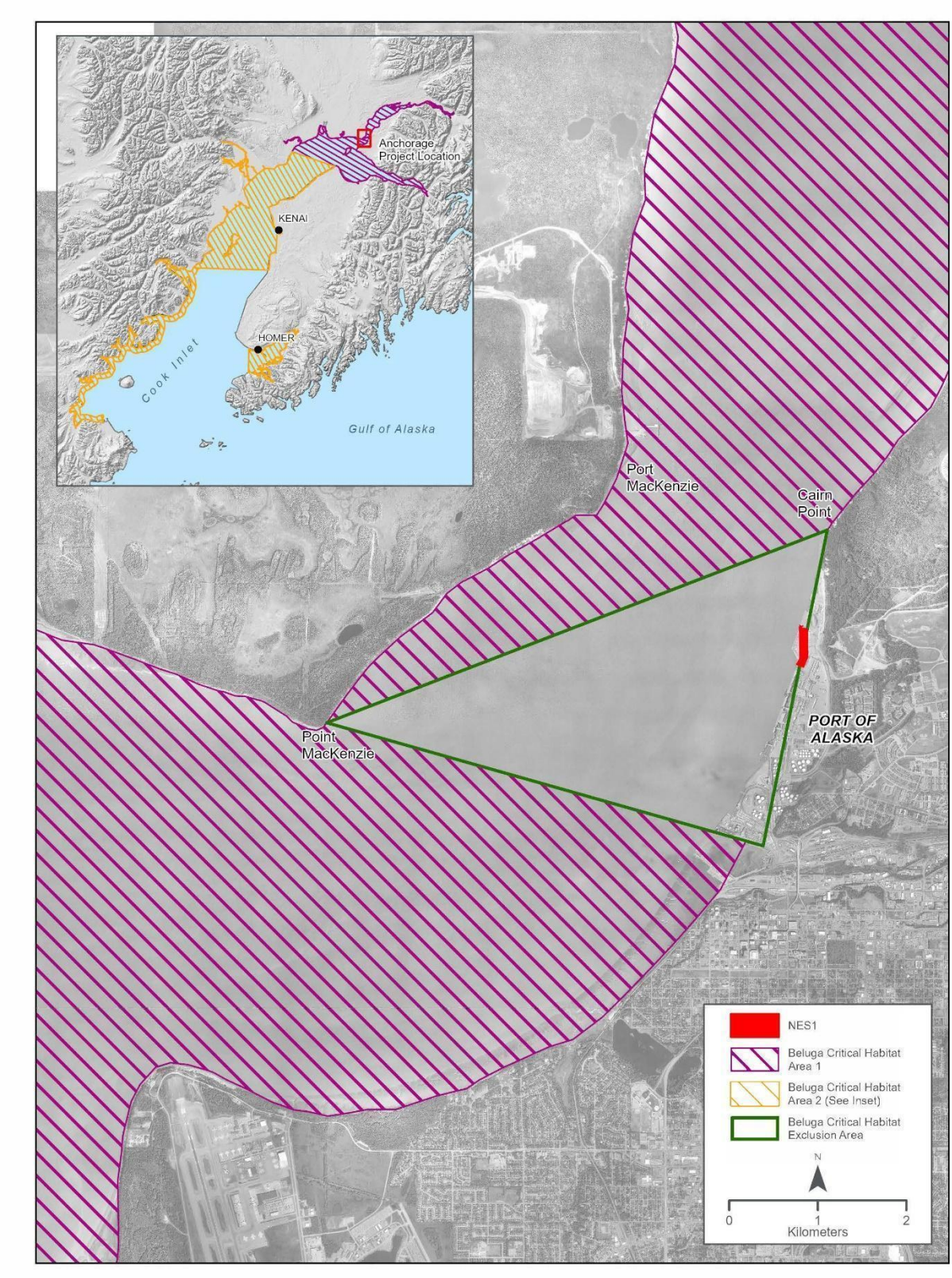


Figure 12. Cook Inlet Beluga Whale Critical Habitat and Exclusion Zone at the POA

3.2.3 Marine Mammals

The marine mammals with potential to be harassed, incidental to construction of NES1 are the Cook Inlet beluga whale; Western DPS of the Steller sea lion; harbor seal; harbor porpoise; killer whale; gray whale; and the Hawaii, Mexico, and Western North Pacific DPSs of the humpback whale. Beluga whales, harbor seals, and harbor porpoises are the species most likely to be sighted during construction of NES1.

Table 6 provides a summary of the abundance, occurrence, and status of the marine mammals likely to occur in the NES1 Project area based on NMFS' 2022 Stock Assessment Reports (Carretta et al., 2023; Young et al., 2023) and, for beluga whales, the recently released update on their abundance (Goetz et al. 2023). Information regarding the distribution, population size, and conservation status for each species is included in the FRN of the proposed IHA (88 FF 76576; 6 November 2023), and NMFS incorporates those descriptions by reference here and summarizes them below. The POA's IHA application and NMFS' FRN of the proposed IHA (88 FR 76576, 6 November 2023) also contain detailed information regarding life history functions, hearing abilities, and distribution, which is also incorporated by reference and briefly summarized below.

The occurrence of the seven species of marine mammals that may occur or are expected or likely to occur in or transit near the action area is based on the following criteria:

- Common – occurring consistently in moderate to large numbers;
- Uncommon – occurring in low numbers or on an irregular basis; and
- Rare – records for some years but limited.

Table 6. Marine Mammals in or near the NES1 Project Area at the POA

Species	Abundance (Population/Stock or DPS)	MMPA Designation	ESA Listing	Occurrence in Project Area
Harbor seal (*Phoca vitulina*)	28,411 (Cook Inlet/Shelikof Strait Stock)	None	None	Common
Steller sea lion (*Eumatopias jubatus*)	52,932 (Western DPS)	Depleted & Strategic	Endangered	Uncommon
Harbor porpoise (*Phocoena phocoena*)	31,046 (Gulf of Alaska Stock)	Strategic	None	Uncommon
Killer whale (Orca) (*Orcinus orca*)	1,920 (Eastern North Pacific Alaska Resident Stock) 587 (Gulf of Alaska, Aleutian Islands, & Bering Sea Transient Stock)	None None	None None	Rare
Cook Inlet beluga whale *(Delphinapterus leucas)*	331[a] (Cook Inlet Stock and DPS)	Depleted & Strategic	Endangered	Common
Gray whale (*Eschrichtius robustus*)	26,960 (Eastern North Pacific Stock)	None	None	Rare
Humpback whale *(Megaptera novaeangliae)*	11,278 (Hawaii Stock) NA (Mexico-North Pacific Stock)	None Depleted & Strategic	None Threatened	Rare

Source: Carretta et al., 2023; Young et al., 2023.
Note: DPS = Distinct Population Segment; ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act.
[a] Nbest = 331 individuals (Goetz et al. 2023).

3.2.3.1 ESA-Listed Marine Mammals

For brevity, the details regarding marine mammals in this document are limited to only those needed to evaluate whether a significant environmental impact exists. Additional details and depth of analysis regarding marine mammals can be found in the IHA application and the FRN of the proposed IHA 88 FR 76576, 6 November 2023).

Cook Inlet Beluga Whale

Status and Distribution

The Cook Inlet beluga whale Stock and DPS resides year-round in Cook Inlet (Laidre et al. 2000; Castellote et al. 2020) and is the most isolated beluga whale stock in Alaska (Young et al. 2023). No systematic surveys for abundance of Cook Inlet beluga whales were conducted prior to 1994; however, the ADF&G conducted a survey of Cook Inlet beluga whales in August 1979 and estimated 1,293 individuals (Calkins 1989). This survey provides the best available estimate for historical beluga whale abundance in Cook Inlet and was used by NMFS to establish 1,300 beluga whales as the carrying capacity in Cook Inlet (65 FR 34590).

NMFS began comprehensive, systematic aerial surveys of beluga whales in Cook Inlet in 1994. These surveys documented a decline in abundance of nearly 50 percent between 1994 and 1998, from an estimate of 653 to 347 whales (Rugh et al. 2000). Annual abundance surveys were conducted each June from 1999 through 2012, but in 2013, NMFS changed the survey to a biennial schedule.

Analysis of survey data from 1999 to 2016 indicated that the population continued to decline at an annual rate of 0.4 percent (Shelden et al. 2015, 2017). However, using a Bayesian statistical method developed by Boyd et al. (2019), an analysis conducted by Shelden and Wade (2019) indicates that from 2008 to 2010, the Cook Inlet beluga whale population was declining at an annual rate of 2.3 percent (Shelden and Wade 2019). The most recent surveys were conducted in 2021 and 2022 and produced an abundance estimate of 331 beluga whales (Table 7) with a 95 percent probability range of 290 to 386 whales (Goetz et al. 2023). This analysis indicates that from 2012 to 2022, the Cook Inlet beluga whale population was increasing at an annual rate of 0.9 percent (Goetz et al. 2023).

Table 7. Annual Cook Inlet Beluga Whale Abundance Estimates

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2014	2016	2018	2022
367	435	386	313	357	366	278	302	375	375	321	340	284	312	340	328	279	331

Source: Hobbs et al. 2000, 2011, 2012; Rugh et al. 2003, 2004a, 2004b, 2005a, 2005b, 2005c, 2006a, 2006b, 2007; Hobbs and Shelden 2008; Allen and Angliss 2010, 2011; Shelden et al. 2013, 2015, 2017; Shelden and Wade 2019; Boyd et al. 2019; Goetz et al. 2023.
Note: Abundance surveys were not completed in 2013, 2015, 2017, 2019, and 2020. An abundance estimate was not calculated from the 2022 survey data.

In 1999, NMFS received petitions to list the Cook Inlet beluga whale DPS as an endangered species under the ESA (64 FR 17347); however, it was not until 17 October 2008, that NMFS announced the listing of the population as endangered under the ESA (73 FR 62919). The Cook Inlet beluga whale stock was designated as depleted under the MMPA in 2000, indicating that the size of the stock was below its Optimum Sustainable Population (OSP) level (65 FR 34590). The population has remained below its OSP level since the designation but would be considered recovered once the population estimate rises above the OSP level. In September 2022, NOAA Fisheries completed the ESA 5-year review for the Cook Inlet beluga whale DPS and determined that the Cook Inlet beluga whale DPS should remain listed as endangered (NMFS 2022a).

Foraging Ecology

Cook Inlet beluga whales feed on a wide variety of prey species, particularly those that are seasonally abundant. In spring, the preferred prey species are eulachon and cod (gadids). Other fish and invertebrate species found in the stomachs of beluga whales include porifera, polychaetes, mysids, amphipods, shrimp, crabs, and marine worms. Some of the species may be found in beluga whale stomachs from secondary ingestion because species such as cod feed on polychaetes, shrimp, amphipods, and mysids, as well as other fish (e.g., walleye pollock [*Gadus chalcogrammus*], and flatfish) and invertebrates (Quakenbush et al. 2015).

From late spring through summer, most beluga whale stomachs sampled contained Pacific salmon, which corresponded to the timing of fish runs in the area. Anadromous smolt and adult fish aggregate at river mouths and adjacent intertidal mudflats (Calkins 1989). All five Pacific salmon species (Chinook, pink, coho, sockeye, and chum) spawn in rivers throughout Cook Inlet (Moulton 1997; Moore et al. 2000). Pacific salmon, overall, represent the highest percent frequency of occurrence of prey species in Cook Inlet beluga whale stomachs. This suggests that their spring feeding in upper Cook Inlet, principally on fat-rich fish such as salmon and eulachon, is important to the energetics of these animals (NMFS 2016b).

Distribution in Cook Inlet

Beluga whales are year-round residents in Cook Inlet (Rugh et al. 2000; Castellote et al. 2020), though they display seasonal movements throughout the Inlet. Large aggregations of beluga whales occur near the mouths of rivers and streams when anadromous fish are present (Moore et al. 2000; Shelden and Wade 2019; McGuire et al. 2020; Castellote et al. 2020).

During spring and summer, beluga whales generally aggregate near the warmer waters of river mouths where prey availability is high and predator occurrence is low (Moore et al. 2000; Shelden and Wade 2019; McGuire et al. 2020; Castellote et al. 2020). Since the mid-1990s, most beluga whales (96 to 100 percent) aggregate in shallow areas near river mouths in upper Cook Inlet, and they are rarely sighted in the central or southern portions of Cook Inlet during summer (Hobbs et al. 2008). Important calving grounds are located near the river mouths of upper Cook Inlet, and peak calving occurs between July and October (McGuire et al. 2016). Data regarding fall and winter habitat use by beluga whales is limited, but a few tagging studies have attempted to fill this knowledge gap (Hobbs 2005, 2012, Goetz et al. 2012b). Generally fewer observations of beluga whales are reported from the Anchorage and Knik Arm area from November through April (76 FR 20180; Rugh et al. 2000, 2004a).

Presence in the NES1 Project Area

Beluga whales are the marine mammals most likely to be encountered in the Project area. As part of their permitting requirements for the MTRP, the POA conducted a NMFS-approved monitoring program for beluga whales and other marine mammals, focused on the POA area from 2005 to 2011. The POA also conducted NMFS-approved monitoring in 2016 for the TPP, and from 2020 to 2022 for the PCT and SFD projects. Knik Arm is one of three areas in upper Cook Inlet where beluga whales concentrate during spring, summer, and early fall. Most beluga whales observed in or near the POA are transiting between upper Knik Arm and other portions of Cook Inlet, and the POA itself is not considered high-quality foraging habitat or a primary habitat for calving. Beluga whales tend to follow their anadromous prey and travel in and out of Knik Arm with the tides. Their use of Knik Arm is concentrated between August and October and may be highest in October (61N Environmental 2021, 2022a, 2022c), lowest in winter (December through February), and remain low in spring and early summer (March–July; Funk et al. 2005; U.S. Army Garrison Fort Richardson 2009; Hobbs et al. 2011, 2012; 61N Environmental 2021, 2022a, 2022c).

Critical Habitat

On 11 April 2011, NMFS designated two areas of critical habitat for beluga whales in Cook Inlet (76 FR 20180). Designated critical habitat includes 7,800 km^2 (3,013 mi^2) of marine and estuarine habitat in Cook Inlet, encompassing approximately 1,909 km^2 (738 mi^2) in Area 1 and 5,891 km^2 (2,275 mi^2) in Area 2 (Figure 12). Critical habitat does not include two areas of military usage: the Eagle River Flats Range on Fort Richardson and military lands of Joint Base Elmendorf-Richardson (JBER) between MHHW and mean high water. Additionally, the POA, adjacent navigation channel, and turning basin, were excluded from critical habitat designation due to national security reasons. Primary Constituent Elements, essential features important to the conservation of the Cook Inlet beluga whale, were established with the critical habitat designation and are outlined in the IHA application.

Steller Sea Lion

Status and Distribution

Two DPSs of Steller sea lion occur in Alaska: the Western DPS and the Eastern DPS. The Western DPS includes animals that occur west of Cape Suckling, Alaska, and therefore includes individuals in the Project area. The Western DPS was listed under the ESA as threatened in 1990, and its continued population decline resulted in a change in listing status to endangered in 1997 (62 FR 24345). Since 2000, studies indicate that the population east of Samalga Pass (i.e., east of the Aleutian Islands) has increased and is potentially stable (Young et al. 2023). For the region that encompasses Cook Inlet (Central Gulf of Alaska), the annual trend in counts (annual rates of change) of Western DPS Steller sea lions is 3.78 for non-pups (adults and juveniles) and 3.01 for pups for the period 2006 through 2021 (Young et al. 2023; Sweeney et al. 2022). The most recent abundance estimate for the Western DPS is 12,581 pups and 40,351 non-pups, totaling 52,932 individuals (Young et al. 2023).

Foraging Ecology

Steller sea lions feed on seasonally abundant prey throughout the year, predominately on species that aggregate in schools or for spawning. They adjust their distribution based on the availability of prey species. Principal prey include eulachon, walleye pollock, capelin (*Mallotus villosus*), mackerel (*Scomber scombrus*), Pacific salmon, Pacific cod, flatfishes, rockfishes, Pacific herring, sand lance, skates, squid, and octopus (Womble and Sigler 2006; Womble et al. 2009).

Presence in Cook Inlet

Steller sea lions have not been documented in upper Cook Inlet during beluga whale aerial surveys conducted annually in June from 1994 through 2012 and in 2014 (Shelden et al. 2013, 2015, 2017; Sheldon and Wade 2019); however, an increase in individual Steller sea lion sightings near the POA has occurred in recent years.

Presence in the NES1 Project Area

Steller sea lions were observed near the POA in June 2009, 2016, and 2019 through 2022 (ICRC 2009; Cornick and Seagars 2016; POA 2019b; 61N Environmental 2021, 2022a, 2022b, 2022c). In 2009, three Steller sea lion sightings occurred that were believed to be the same individual (ICRC 2009). In 2016, Steller sea lions were observed on two separate days. On 02 May 2016, one individual was sighted. On 25 May 2016, five Steller sea lion sightings occurred within a 50-minute period, and these sightings occurred in areas relatively close to one another (Cornick and Seagars 2016). Given the proximity in time and space, it is believed these five sightings were of the same individual Steller sea lion. In 2019, one Steller sea lion was observed in June at the POA during transitional dredging (POA 2019b). Six sightings of individual Steller sea lions occurred near the POA in May and June 2020 during PCT Phase 1 construction monitoring that took place from 27 April through 24 November 2020(61N Environmental 2021). In 2021, a total of eight sightings of individual Steller sea lions occurred in May, June, and September near the POA during PCT Phase 2 construction monitoring (61N Environmental 2022a). In May through June 2022, four Steller sea lion sightings occurred during the transitional dredging and SFD construction monitoring (61N Environmental 2022b, 2022c). During NMFS marine mammal monitoring, one Steller sea lion was observed August 2021 in the middle of the inlet looking and diving (Easley-Appleyard and Leonard, 2022). In 2022, three Steller sea lion sightings occurred during the transitional dredging monitoring and three occurred during SFD construction monitoring (61N Environmental 2022b, 2022c). All sightings have occurred during summer, when the sea lions were likely attracted to ongoing salmon runs. Sea lion observations near the POA may be increasing due to more consistent observation effort or due to increased presence.

Humpback Whale

Humpback whales worldwide were designated as endangered under the Endangered Species Conservation Act in 1970 and were listed under the ESA at its inception in 1973. However, on 08 September 2016, NMFS published a final decision that changed the status of humpback whales under the ESA (81 FR 62259), effective 11 October 2016. The decision recognized the existence of 14 DPSs based on distinct breeding areas in tropical and temperate waters. Five of the 14 DPSs were classified under the ESA (four endangered and one threatened), while the other nine DPSs were delisted. On 21 April 2021, NMFS published a final rule to designate critical habitat for three of the listed DPSs (86 FR 21082). No critical habitat was designated in or near the NES1 Project area.

The most comprehensive photo-identification data available suggest that approximately 89 percent of all humpback whales in the Gulf of Alaska are members of the Hawaii DPS, 11 percent are from the Mexico DPS, and less than 1 percent are from the Western North Pacific DPS (Wade 2021; Carretta et al., 2023; Young et al. 2023). The Hawaii DPS is not listed under the ESA, the Mexico DPS is listed as threatened, and the Western North Pacific DPS is listed as endangered. Members of different DPSs are known to

intermix in feeding grounds; therefore, all waters off the coast of Alaska should be considered to have ESA-listed humpback whales.

The 2022 NMFS Alaska and Pacific Stock Assessment Reports (SARs) described a revised stock structure for humpback whales which modifies the previous stocks designated under the MMPA to align more closely with the ESA-designated DPSs (Carretta et al. 2023; Young et al. 2023). Specifically, the three previous North Pacific humpback whale stocks (Central and Western North Pacific stocks and a CA/OR/WA stock) were replaced by five stocks, largely corresponding with the ESA-designated DPSs. These include Western North Pacific and Hawaii stocks and a Central America/Southern Mexico-California (CA)/Oregon (OR)/Washington (WA) stock (which corresponds with the Central America DPS). The remaining two stocks, corresponding with the Mexico DPS, are the Mainland Mexico-CA/OR/WA and Mexico-North Pacific stocks (Carretta et al. 2023; Young et al. 2023). The former stock is expected to occur along the west coast from California to southern British Columbia, while the latter stock may occur across the Pacific, from northern British Columbia through the Gulf of Alaska and Aleutian Islands/Bering Sea region to Russia.

The Hawaii stock consists of one demographically independent population (DIP) (Hawaii - Southeast Alaska / Northern British Columbia DIP) and the Hawaii - North Pacific unit, which may or may not be composed of multiple DIPs (Wade et al. 2021). The DIP and unit are managed as a single stock at this time, due to the lack of data available to separately assess them and lack of compelling conservation benefit to managing them separately (NMFS 2019, 2022c, 2023). The DIP is delineated based on two strong lines of evidence: genetics and movement data (Wade et al. 2021). Whales in the Hawaii - Southeast Alaska/Northern British Columbia DIP winter off Hawaii and largely summer in Southeast Alaska and Northern British Columbia (Wade et al. 2021). The group of whales that migrate from Russia, western Alaska (Bering Sea and Aleutian Islands), and central Alaska (Gulf of Alaska excluding Southeast Alaska) to Hawaii have been delineated as the Hawaii-North Pacific unit (Wade et al. 2021). There are a small number of whales that migrate between Hawaii and southern British Columbia/Washington, but current data and analyses do not provide a clear understanding of which unit these whales belong to (Wade et al. 2021, Carretta et al. 2023, Young et al. 2023).

The Mexico-North Pacific stock is likely composed of multiple DIPs, based on movement data (Martien et al. 2021, Wade 2021, Wade et al. 2021). However, because currently available data and analyses are not sufficient to delineate or assess DIPs within the unit, it was designated as a single stock (NMFS 2019, 2022d, 2023). Whales in this stock winter off Mexico and the Revillagigedo Archipelago and summer primarily in Alaska waters (Martien et al. 2021, Carretta et al., 2023, Young et al. 2023).

Humpback whales experienced large population declines due to commercial whaling operations in the early twentieth century. Barlow (2003) estimated the population of humpback whales at approximately 1,200 animals in 1966. The population in the North Pacific grew to between 6,000 and 8,000 by the mid-1990s. Current threats to humpback whales include vessel strikes, releases of chemicals or hydrocarbons into the marine environment, climate change, and commercial fishing operations (Carretta et al. 2023; Young et al. 2023).

Foraging Ecology

Humpback whales target aggregations of krill (Euphausiidae; Nemoto 1957) and small schooling fish, including herring (Krieger and Wing 1984), capelin (Witteveen et al. 2008), sand lance (Hazen et al. 2009), and juvenile salmon (Chenoweth et al. 2017). In Alaska waters, the species composition of prey taken by humpback whales varies, likely due to prey availability and individual preference (Witteveen et al. 2011).

Presence in Cook Inlet

Humpback whales are encountered regularly in lower Cook Inlet and occasionally in mid-Cook Inlet; however, sightings are rare in upper Cook Inlet. During aerial surveys conducted in summers between

2005 and 2012, Shelden et al. (2013) reported dozens of sightings in lower Cook Inlet, a handful of sightings in the vicinity of Anchor Point and in lower Cook Inlet, and no sightings north of 60° North latitude. NMFS changed to a biennial survey schedule starting in 2014 after analysis showed there would be little reduction in the ability to detect a trend given the current growth rate of the population (Hobbs, 2013). No survey took place in 2020. Instead, consecutive surveys took place in 2021 and 2022 (Shelden et al. 2022). During the 2014 to 2022 aerial surveys, sightings of humpback whales were recorded in lower Cook Inlet and mid-Cook Inlet, but none were observed in upper Cook Inlet (Shelden et al. 2015, 2017, 2019, 2022). Vessel-based observers participating in the Apache Corporation's 2014 survey operations recorded three humpback whale sightings near Moose Point in upper Cook Inlet and two sightings near Anchor Point, while aerial and land-based observers recorded no humpback whale sightings, including in the upper Inlet (Lomac-MacNair et al. 2014). Observers monitoring waters between Point Campbell and Fire Island during summer and fall 2011 and spring and summer 2012 recorded no humpback whale sightings (Brueggeman et al. 2013). Monitoring of Turnagain Arm during ice-free months between 2006 and 2014 yielded one humpback whale sighting (McGuire, unpublished data; cited in LGL Alaska Research Associates, Inc. and DOWL 2015).

Presence in the NES1 Project Area

Few humpback whale sightings have occurred in the project area. Humpback whales were not documented during POA construction or scientific monitoring from 2005 to 2011, in 2016, or 2020 (Prevel-Ramos et al. 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick et al. 2010, 2011; ICRC 2009, 2010, 2011, 2012; Cornick and Pinney 2011; Cornick and Seagars 2016; 61N Environmental 2021). Observers monitoring the Ship Creek Small Boat Launch from 23 August to 11 September 2017 recorded two sightings, each of a single humpback whale, which was presumed to be the same individual (POA 2017). In 2017, an event involved a stranded whale that was sighted near several locations in upper Cook Inlet before washing ashore at Kincaid Park; it is unclear whether the humpback whale was alive or deceased upon entering Cook Inlet waters. No humpback whales were observed during the 2020 to 2021 PCT construction monitoring, the NMFS marine mammal monitoring, or during the 2022 transitional dredging and SFD construction monitoring from April to June 2022 (61N Environmental 2021, 2022a, 2022b, 2022c; Easley-Appleyard and Leonard, 2022). One humpback whale was observed in July during 2022 transitional dredging monitoring (61N Environmental 2022c).

Gray Whale

Status and Distribution

There are two populations of gray whales present in the North Pacific: the Western North Pacific Stock and the Eastern North Pacific Stock (Carretta et al. 2023). The current stock structure for gray whales in the Pacific has been in the process of being re-examined for a number of years and remains uncertain as of the most recent (2022) Pacific SAR (Carretta et al. 2023); gray whales are not addressed in the Alaska SAR (Young et al. 2023). Gray whale population structure is not determined by simple geography and may be in flux due to evolving migratory dynamics (Carretta et al. 2023).

The Western North Pacific Stock of gray whales is listed as endangered, and no critical habitat has been designated for this species. The Eastern North Pacific Stock recovered from whaling exploitation, was delisted under the ESA in 1994 and is not considered depleted (Carretta et al. 2022). Western North Pacific gray whales are not known to feed in or travel to upper Cook Inlet (Conant and Lohe 2023; Weller et al. 2023). Gray whales near the project area are assumed to be from the Eastern North Pacific Stock.

An Unusual Mortality Event (UME) along the West Coast and Alaska was declared for gray whales in January 2019 (NMFS 2022e). Since 2019, 143 gray whales have stranded off Alaska. Preliminary findings for several of the whales indicate evidence of emaciation, but the UME is still under investigation, and the cause of the mortalities remains unknown (NMFS 2022e).

Foraging Ecology

Gray whales are mainly bottom feeders. They obtain their food by scraping the sides of their heads along the ocean floor and scooping up sediments. They capture small invertebrates on their baleen by expelling the sediment and other particles through the baleen fringes (ADF&G 2022). In Alaska waters, gray whales primarily eat amphipod crustaceans, although a wide variety of species were reported from gray whale stomachs, such as amphipods (e.g., *Anonyx*, *Atylus*, Lembos, Pontoporeia), decapods (e.g., Chionoecetes, Nectocrangdon, Nephrops), and other invertebrates (mollusks, polychaete worms, and even sponges) (Moore et al. 2003; ADF&G 2022).

Presence in Cook Inlet

Gray whales are infrequent visitors to Cook Inlet, but may be seasonally present during spring and fall in the lower inlet (BOEM 2021). Migrating gray whales pass through the inlet during their spring and fall migrations to and from their primary summer feeding areas in the Bering, Chukchi, and Beaufort seas (Swartz 2018; Carretta et al. 2019; Silber et al. 2021; BOEM 2021).

Gray whales are rarely documented in upper Cook Inlet. In 2020, an individual swam upstream in Cook Inlet during a very high tide and was trapped when the water receded (George 2020). The gray whale was first encountered in May near the Seward Highway Bridge and a week later, the tide finally pushed the whale into Turnagain Arm. On 12 June, a dead gray whale was spotted near the mouth of the Susitna River. It is suspected that this was the same gray whale seen in May (George 2020). There is no indication that work at the PCT during this time period had any effect on the animal. Based on photos and video NMFS collected of the whale, veterinarians determined the whale was in fair to poor condition.

Presence in the NES1 Project Area

Gray whales are rarely encountered in the project area. Gray whales were not documented during POA construction or scientific monitoring from 2005 to 2011 or during 2016 (Prevel-Ramos et al. 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick et al. 2010, 2011; ICRC 2009, 2010, 2011, 2012; Cornick and Pinney 2011; Cornick and Seagars 2016). One gray whale was observed during the 2020 PCT construction near Port Mackenzie (61N Environmental 2021) (possibly the same whale that stranded on June 12, 2020, described above) and a second was observed off Ship Creek during 2021 PCT construction monitoring (61N Environmental 2022a). During NMFS marine mammal monitoring in 2021, on 10 August, one gray whale surfaced directly in front of the Point Woronzof PSO station traveling west out of the inlet approximately 700 m offshore (Easley-Appleyard and Leonard, 2022). No gray whales were observed during the 2022 transitional dredging or SFD construction monitoring from May to August (61N Environmental 2022b, 2022c).

3.2.3.2 Non-ESA-Listed Marine Mammals

Harbor Seal

Harbor seals inhabit waters all along the western coast of the U.S., British Columbia, and north through Alaska waters to the Pribilof Islands and Cape Newenham. Twelve recognized stocks of harbor seals occur in Alaska. Harbor seals in the Project area are members of the Cook Inlet/Shelikof stock; no other stock is present in the Project area. Distribution of the Cook Inlet/Shelikof stock extends from Unimak Island, in the Aleutian Islands archipelago, north through all of upper and lower Cook Inlet (Young et al. 2023).

The current abundance estimate for the Cook Inlet/Shelikof stock is based on aerial survey data from 1996 through 2018 and is estimated at 28,411 individuals, with a negative population growth trend of -111 seals per year (Young et al. 2023). The estimated average annual subsistence harvest of the Cook Inlet/Shelikof stock was 233 individuals between 2004 and 2008, and 104 individuals in 2014 (Muto et al. 2022). Harbor seals are not listed under the ESA or designated as depleted or strategic under the MMPA, but like all marine mammals, they are protected under the MMPA.

Harbor seals inhabit the coastal and estuarine waters of Cook Inlet and are observed in both upper and lower Cook Inlet throughout most of the year (Boveng et al. 2012; Shelden et al. 2013). Research on satellite-tagged harbor seals observed several movement patterns in Cook Inlet (Boveng et al. 2012). In fall, a portion of the harbor seals appeared to move out of Cook Inlet and into Shelikof Strait, northern Kodiak Island, and coastal habitats of the Alaska Peninsula. The western coast of Cook Inlet had higher usage by harbor seals than eastern coast habitats, and seals captured in lower Cook Inlet generally exhibited site fidelity by remaining south of the Forelands after release (south of Nikiski; Boveng et al. 2012).

The presence of harbor seals in upper Cook Inlet is seasonal. Harbor seals are commonly observed along the Susitna River and other tributaries in upper Cook Inlet during eulachon and Pacific salmon migrations (NMFS 2003). The major haulout sites for harbor seals are in lower Cook Inlet; however, a few haulouts are located in upper Cook Inlet, including near the Little and Big Susitna rivers, Beluga River, Theodore River, and Ivan River (Barbara Mahoney, pers. comm., 16 November 2020; Montgomery et al. 2007). During beluga whale aerial surveys of upper Cook Inlet from 1993 to 2012, harbor seals were observed 24 to 96 km (15 to 60 mi) south-southwest of Anchorage at the Chickaloon, Little Susitna, Susitna, Ivan, McArthur, and Beluga rivers (Shelden et al. 2013).

Harbor seals are commonly observed in the Project area, particularly foraging near the mouth of Ship Creek (Cornick et al. 2011; Shelden et al. 2013; 61N Environmental 2021, 2022a), which is approximately 2,500 meters (m) from the southern end of the NES1 Project. During annual marine mammal surveys conducted by NMFS since 1994, harbor seals have been observed in Knik Arm and in the vicinity of the POA (Shelden et al. 2013), but are not known to haul out in the Project area.

Harbor seals have been observed during construction monitoring at the POA from 2005 through 2011 and in 2016; data were unpublished for 2005 through 2007 (Prevel-Ramos et al. 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick et al. 2010, 2011). Harbor seals were observed in groups of one to seven individuals (Cornick et al. 2011; Cornick and Seagars 2016). Harbor seals were also observed near the POA during construction monitoring for PCT Phase 1 in 2020 and PCT Phase 2 in 2021, NMFS marine mammal monitoring in 2021, and transitional dredging monitoring and SFD construction monitoring in 2022 (61N Environmental 2021, 2022a, 2022b, 2022c, Easley-Appleyard and Leonard 2022). Sighting rates of harbor seals have been highly variable and may have increased from MTRP monitoring between 2005 and 2011, and PCT monitoring in 2020 and 2021. It is unknown whether any potential increase was due to local population increases or habituation to ongoing construction activities. It is possible that increased sighting rates are correlated with more intensive monitoring efforts in 2020 and 2021, when the POA used 11 PSOs spread among four monitoring stations.

During 2020 PCT Phase 1 construction monitoring, harbor seals were regularly observed in the vicinity of the POA with frequent observations near the mouth of Ship Creek, southeast of the NES1 Project location. Harbor seals were observed almost daily during pile driving, with 54 sightings documented in July, 66 in August, and 44 in September (61N Environmental 2021). During 2021 PCT Phase 2 construction, harbor seals were observed during pile driving with the highest numbers of sightings in June (87 individuals) and September (124 individuals). Preliminary observation data indicate that the most common behavior of harbor seals documented during the 2020 PCT Phase 1 construction is described as "looking and sinking," with that behavior documented throughout all hours of observation. Over the 13 days of SFD construction monitoring in May and June 2022, 27 groups of one individual harbor seal were observed (61N Environmental 2022b). Seventy-two groups of 75 total harbor seals (single individuals and three groups of two individuals) were observed during transitional dredging monitoring in 2022 (61N Environmental 2022c).

Harbor Porpoise

In the eastern North Pacific Ocean, harbor porpoise range from Point Barrow, along the Alaska coast, and down the west coast of North America to Point Conception, California. The 2022 Alaska SARs describe a revised stock structure for harbor porpoises (Young et al. 2023). Previously, NMFS had designated three stocks of harbor porpoises: the Bering Sea stock, the Gulf of Alaska stock, and the Southeast Alaska stock (Muto et al., 2022; Zerbini et al., 2022). The 2022 Alaska SARS split the Southeast Alaska three separate stocks, resulting in five separate stocks for this species in Alaskan waters. This update better aligns harbor porpoise stock structure with genetics, trends in abundance, and information regarding discontinuous distribution trends (Young et al., 2023). Harbor porpoises found in Cook Inlet are assumed to be members of the Gulf of Alaska stock, which is a strategic stock (Young et al., 2023).

The Gulf of Alaska stock, which includes individuals in Cook Inlet, is currently estimated at 31,046 individuals (Young et al. 2023). Dahlheim et al. (2000) estimated abundance and density of harbor porpoises in Cook Inlet from surveys conducted in the early 1990s. The estimated density of animals in Cook Inlet was 7.2 per 1,000 km^2, with an abundance estimate of 136 (Dahlheim et al. 2000), indicating that only a small number use Cook Inlet. Hobbs and Waite (2010) estimated a harbor porpoise density in Cook Inlet of 13 per 1,000 km^2 from beluga whale aerial surveys in the late 1990s. Neither of these surveys included coastlines, which have been documented to be used heavily by harbor porpoises (Shelden et al. 2014).

Harbor porpoises have been observed in Knik Arm during monitoring efforts since 2005. During POA construction from 2005 through 2011 and in 2016, harbor porpoises were reported in 2009, 2010, and 2011 (Prevel-Ramos et al. 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick et al. 2010, 2011; Cornick and Seagars 2016). In 2009, a total of 20 harbor porpoises were observed during construction monitoring, with sightings in June, July, August, October, and November. Harbor porpoises were observed twice in 2010: once in July and again in August. In 2011, POA monitoring efforts documented harbor porpoises five times, with a total of six individuals in August, October, and November at the POA (Cornick et al. 2011). During other monitoring efforts conducted in Knik Arm, four sightings of harbor porpoises occurred in 2005 (Shelden et al. 2014), and a single harbor porpoise was observed in the vicinity of the POA in October 2007 (URS 2008). No harbor porpoises were observed in 2016. A total of 18 harbor porpoises were observed near the POA from 27 April through 24 November 2020 during Phase 1 PCT construction monitoring (61N Environmental 2021). In 2021, a total of 27 harbor porpoises were observed near the POA during the PCT Phase 2 construction monitoring, which took place between 26 April and 29 September 2021 (61N Environmental 2022a). During the 2021 NMFS marine mammal monitoring, one harbor porpoise was observed in August and six were observed in October (Easley-Appleyard and Leonard 2022). During 2022, five harbor porpoises were sighted during transitional dredging monitoring (61N Environmental 2022c). None were sighted during the 2022 SFD construction monitoring that occurred between May and June 2022 (61N Environmental 2022b).

Killer Whale

Three distinct ecotypes of killer whale are found in the northeastern Pacific Ocean: resident, transient, and offshore killer whales. Two stocks have the potential to be in the Project area, the Eastern North Pacific Alaska Residents and the Gulf of Alaska, Aleutian Islands, and Bering Sea Transients. Both ecotypes overlap in the same geographic area; however, they maintain social and reproductive isolation and feed on different prey species. The population of the Eastern North Pacific Alaska Resident stock of killer whales contains an estimated 2,347 animals and the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock of killer whales is estimated to contain 587 animals (Muto et al. 2022). Killer whales are rare in Cook Inlet, and most individuals are observed in lower Cook Inlet (Shelden et al. 2013).

Few killer whales, if any, are expected to approach or be in the vicinity of the Project during construction of NES1. No killer whales were spotted in the vicinity of the POA during surveys by Funk et al. (2005), Ireland et al. (2005), or Brueggeman et al. (2007, 2008a, 2008b). Killer whales have also not been

documented during any POA construction or scientific monitoring from 2005 to 2011, in 2016, or in 2020 (Prevel-Ramos et al. 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008; ICRC 2009, 2010, 2011, 2012; Cornick et al. 2010, 2011; Cornick and Pinney 2011; Cornick and Seagars 2016; 61N Environmental 2021). Two killer whales, one male and one juvenile of unknown sex, were sighted offshore of Point Woronzof in September 2021 during PCT Phase 2 construction monitoring (61N Environmental 2022a). The pair of killer whales moved up Knik Arm, reversed direction near Cairn Point, and traveled southwest out of Knik Arm toward the open water of Upper Cook Inlet. No killer whales were sighted during the 2021 NMFS marine mammal monitoring or 2022 transitional dredging and SFD construction monitoring that occurred between May and June 2022 (Easley-Appleyard and Leonard 2022; 61N Environmental 2022b, 2022c).

3.2.3.3 Marine Mammal Acoustics and Hearing

Since the potential effects of sound on marine mammal species present in the action area, involve analysis of the manner in which sound interacts with the physiology of marine mammals and the potential responses of those animals to sound,[15] general information about sound and marine mammal hearing is provided in this section, and potential effects of sound on marine mammal species are provided in Section 4.6.2.3. An understanding of the frequency ranges marine mammals are able to hear (described in this section) is essential to the consideration of the effects of pile driving on marine mammals specified in the POA's IHA application and explained in the FRN of the proposed IHA (86 FR 31780, 6 November 2023) to be issued under the MMPA. The exposure estimates associated with the activities specified in the application and the notice of the proposed IHA were considered in addition to other factors that may affect the impacts of those exposures on marine mammals.

Overview of Sound and Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals because they rely on sound to obtain detailed information about their surroundings, communicate, navigate, reproduce, socialize, and avoid predators. Therefore, the surrounding soundscape is a key component of marine mammal habitat and can be considered their acoustic habitat (Clark et al. 2009). Underwater sound comes from numerous natural sources (biological and physical processes) and anthropogenic sources. Biological sounds include marine life (marine mammals, fish, snapping shrimp). Physical sounds include wind and wave activity, rain, cracking sea ice, undersea earthquakes, and volcano eruptions. Anthropogenic sound includes shipping and other vessel traffic, military activity, marine construction, oil and gas exploration, and more. Some of these natural and anthropogenic sounds are present more or less everywhere in the ocean all of the time; therefore, background sound in the ocean is commonly referred to as "ambient noise" (Discovery of Sound in the Sea 2019).

Sound travels in waves, the basic components of which make up frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in Hertz or cycles per second. Wavelength is the distance between two peaks or corresponding points of a sound wave (length of one cycle). Higher frequency sounds have shorter wavelengths than lower frequency sounds, and typically attenuate (decrease) more rapidly, except in certain cases in shallower water. Amplitude is the height of the sound pressure wave or the "loudness" of a sound and is typically described using the relative unit of the decibel. When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in a manner similar to ripples on the surface of a pond, and may be directed either in a beam or beams or may radiate in all directions

[15] For example, predicting how many marine mammals could be harassed required potential effects to be evaluated within the context of applicable laws and regulations. Both the MMPA and ESA require that all anticipated responses to sound resulting from the proposed research activities be considered relative to their potential impact on animal growth, survivability, and reproduction. Although a variety of effects may result from an acoustic exposure, not all effects will impact survivability or reproduction (e.g., short-term changes in respiration rate would have no effect on survivability or reproduction).

(omnidirectional sources). The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and human-made sound receptors such as hydrophones.

The sum of various natural and anthropogenic sound sources that comprise background noise at any given location and time depends not only on the source levels (as determined by current weather conditions and levels of biological and human activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on numerous varying factors, background noise levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10 to 20 dB from day to day (Richardson et al. 1995a). The result is that, depending on the source type and its intensity, sound from a specified activity may be a negligible addition to the local soundscape or could form a distinctive signal that may affect marine mammals.

The sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. In general, ambient sound levels (i.e., naturally occurring) tend to increase with increasing wind speed and wave height. Precipitation can be an important component of total sound at frequencies above 500 Hz and possibly down to 100 Hz during quiet times. Marine mammals can contribute significantly to ambient sound levels, as can some fish and snapping shrimp. The frequency band for biological contributions is from approximately 12 Hz to more than 100 kilohertz (kHz). In deep water, low-frequency ambient sound from 1 to 10 Hz comprises mainly turbulent pressure fluctuations from surface waves and the motion of water at the air-water interface. At these frequencies, sound levels depend only slightly on wind speed. Between 20 and 300 Hz, distant ships transiting dominates wind-related sounds. Above 300 Hz, the ambient sound level depends on weather conditions, with wind- and wave-related effects mostly dominating the soundscape. Vessel noise typically dominates the total background sound for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly.

In Cook Inlet, existing anthropogenic sources include shipping and other vessel traffic (e.g., dredging, commercial and recreational fishing) from multiple port locations, pile driving for non-NES1 Project activities, geophysical surveys for research and other purposes, and commercial and recreational fisheries

For frequency ranges marine mammals are able to hear, current data indicate that not all marine mammal species have equal hearing capabilities (e.g., Richardson et al. 1995a; Wartzok and Ketten 1999; Au and Hastings 2008). To reflect this, Southall et al. (2007, 2019) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (i.e., low-frequency cetaceans). Subsequently, NMFS described generalized hearing ranges for these marine mammal hearing groups in their revision to the technical guidance for assessing effects of anthropogenic sound published in April 2018 and in July 2020 (NMFS 2018a). Generalized hearing ranges were chosen based on the approximately 65-dB threshold from the normalized composite audiograms, with the exception of lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall et al. (2007) was retained. Table 8 provides marine mammal hearing groups and their associated hearing ranges. Specific to this action, gray whales and humpback whales are considered low-frequency (LF) cetaceans, beluga whales and killer whales are considered mid-frequency (MF) cetaceans, harbor porpoises are considered high-frequency (HF) cetaceans, Steller sea lions are otariid pinnipeds, and harbor seals are phocid pinnipeds.

Table 8. Marine Mammal Functional Hearing Groups

Hearing Group	Generalized Hearing Range[a]
Low-Frequency Cetaceans (Mysticetes – baleen whales)	7 Hz to 35 kHz
Mid-Frequency Cetaceans (Odontocetes – toothed whales)	150 Hz to 160 kHz
High-frequency Cetaceans (Odontocetes)	275 Hz to 160 kHz
Phocid pinnipeds (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (sea lions and fur seals)	60 Hz to 39 kHz

[a] Represents the generalized hearing range for the entire group as a composite (i.e., all species in the group), where individual species hearing ranges are typically not as broad. Generalized hearing range chosen based on an approximately 65-dB threshold from the normalized composite audiogram, with the exception for lower limits for low-frequency cetaceans (Southall et al. 2007) and Phocid pinniped (approximation). Note: Hz = Hertz; kHz = kilohertz.

3.3 Socioeconomic Environment

3.3.1 Subsistence

While Alaska Natives have traditionally harvested subsistence resources in this region for millennia, only limited hunting of harbor seals currently occurs in the upper Cook Inlet area. Take is authorized only for limited boat-based subsistence hunting.

Due to dramatic declines in the Cook Inlet beluga whale population, on 21 May 1999, legislation was passed to temporarily prohibit (until 01 October 2000) the taking of Cook Inlet beluga whales under the subsistence harvest exemption in Section 101(b) of the MMPA without a cooperative agreement between NMFS and the affected Alaska Native Organizations (Public Law No. 106-31, Section 3022, 113 Statute 57, 100). That prohibition was extended indefinitely on 21 December 2000 (Public Law No. 106-553, Section 1(a)(2), 114 Statute 2762). NMFS subsequently entered into six annual co-management agreements (2000 to 2003, 2005 to 2006) with the Cook Inlet Marine Mammal Council, an Alaska Native organization representing beluga whale hunters, which allowed for the annual harvest of one to two Cook Inlet beluga whales. On 15 October 2008, NMFS published a final rule that established long-term harvest limits on Cook Inlet beluga whales that may be taken by Alaska Natives for subsistence purposes (73 FR 60976). That rule prohibited harvest for a 5-year period (e.g., 2008 to 2012, 2013 to 2017) if the average abundance for the Cook Inlet beluga whales from the prior 5 years (e.g., 2003 to 2007) was below 350 whales. No subsistence harvest of beluga whales has occurred in Cook Inlet since 2005 (NMFS 2016). These figures demonstrate that subsistence harvests of marine mammal species are minimal.

While Steller sea lions are used for subsistence purposes in Alaska, in general, they are not regularly hunted in Cook Inlet, and no known hunting occurs in upper Cook Inlet, given their uncommon occurrence in the action area. The only marine mammal species with subsistence value in upper Cook Inlet is the harbor seal. The Alaska Native subsistence harvest of harbor seals has been estimated by the Alaska Native Harbor Seal Commission (ANHSC) and ADF&G. The minimum, maximum, and average annual harvest for 2004 to 2008, 2011 to 2012, 2014, and 2017 was 177, 288, and 233 harbor seals, respectively (Muto et al. 2022). No subsistence takes of harbor seals are known to occur in the immediate vicinity of the POA. Killer whales, harbor porpoises, and humpback whales in Cook Inlet are not used for subsistence purposes.

Chapter 4 Environmental Consequences

This section evaluates the anticipated environmental impacts resulting from implementation of each of the construction activities presented in Chapter 2. Due to the programmatic nature of this document, general characteristic impacts are described for each activity. The potential impacts would be applicable to the affected environment described in Chapter 3 Affected Environment, with slight variations due to local Project-level site conditions and resources.

The potential impacts have been described by their characteristics: type (direct, indirect, or cumulative), duration (short- or long-term), geographic extent (localized or beyond the Project site), and significance. Each of these characteristics is described in the following sections (Sections 4.1 through 4.4), and summarized in Table 9. Based on this review, this section describes the degree of effects for the affected resources described in Chapter 3.

4.1 Type of Potential Impacts

The following categories are used to describe the timing and proximity of potential impacts on the action area only. They have no bearing on the significance of the potential impacts, as described below, and are used only to describe or characterize the nature of potential impacts. For the purposes of this analysis the timing and proximity of impacts are defined by type below, per 40 CFR 1508.1(g). [16]

- Direct effects, which are caused by the action and occur at the same time and place.
- Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use; population density or growth rate; and related effects on air and water and other natural systems, including ecosystems.
- Cumulative effects, which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

4.2 Duration of Potential Impacts

The duration of the potential impact can be defined as either short-term or long-term and indicates the period of time during which the environmental resource would be impacted. Duration takes into account the permanence of an impact or the potential for natural attenuation of an impact. In general, the impacts of construction and other activities undertaken to implement a proposed Project be short-term, and the impacts of the Project results would be long-term. For the purposes of this analysis, the duration of each potential impact is defined as follows:

- Short-Term Impact: A known or potential impact of limited duration, relative to the proposed Project and the environmental resource. For the purposes of this analysis, these impacts may be instantaneous or may last minutes, hours, days, or years.

[16] The regulatory definition of effects or impacts also reads, "Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial." These effects are analyzed and incorporated into this EA's effects analysis but are not distinctly identified as a type category.

- Long-Term Impact: A known or potential impact of extended duration, relative to the proposed Project and the environmental resource. For the purposes of this analysis, these improvements or disruptions to a given resource would last longer than 5 years.
- Permanent Impact: A known or potential impact that is likely to remain unchanged indefinitely.

4.3 Geographic Extent

Construction activities can cause impacts at a variety of geographic scales. For the purposes of this analysis, impacts are assessed in two ways:

- Localized: Site-specific and generally limited to the immediate surroundings of a Project site.
- Beyond the Project Site: Unconfined or unrestricted to the Project site. These impacts may extend throughout a watershed or beyond.

4.4 Significance of Potential Impacts

The 2022 revised CEQ regulations state that the significance of an action be analyzed the potentially affected environment and the degree of the effects of the action. Agencies should consider connected actions consistent with § 1501.9(e)(1) (40 CFR 1501.3(b))[17]. NOAA's Interim Guidance on Application of Revised CEQ NEPA Regulations (17 June 2022) requires consideration of these two criteria along with additional factors for determining whether the impacts of a proposed action are significant. To determine the proposed action's significance, NOAA qualitatively assessed the degree to which the alternatives would impact a particular resource. The qualitative assessment is based on a review of the available and relevant reference material, and is based on professional judgment using standards that include consideration of the permanence of an impact or the potential for natural attenuation of an impact; the uniqueness or irreplaceability of the resource; the abundance or scarcity of the resource; the geographic, ecological, or other context of the impact; and the potential that mitigation measures can offset the anticipated impact. For the purposes of this analysis, significance definitions are as follows:

- Negligible: The impacts on individual marine mammals and/or their habitat, if any, would be at the lowest levels of detection and barely measurable, with no perceptible consequences to individuals or the population, or to subsistence users.
- Minor: Impacts on individual marine mammals and/or their habitat are detectable and measurable; however, they are of low intensity, short-term, and localized. Impacts on individuals and/or their habitat do not lead to population-level effects, and would not affect the long-term subsistence use of the species.
- Moderate: Impacts on individual marine mammals and/or their habitat are detectable and measurable; they are of medium intensity, can be short-term or long-term, and can be localized or extensive. Impacts on individuals and/or their habitat could have population-level effects that could impact subsistence uses of the species, but the population can sufficiently recover from the impacts or

[17] The CEQ regulations at 1501.3(b)(1) provide, "In considering the potentially affected environment, agencies should consider, as appropriate to the specific action, the affected area (national, regional, or local) and its resources, such as listed species and designated critical habitat under the Endangered Species Act. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend only upon the effects in the local area" and at 1501(b)(2), "In considering the degree of the effects, agencies should consider the following, as appropriate to the specific action: (i) Both short- and long-term effects; (ii) Both beneficial and adverse effects; (iii) Effects on public health and safety, and; (iv) Effects that would violate Federal, State, Tribal, or local law protecting the environment."

enough habitat remains functional to maintain the viability of the species both locally and throughout their range.

- Major: Impacts on individual marine mammals and/or their habitat are detectable and measurable; they are of severe intensity, can be long lasting or permanent, and are extensive. Impacts to individuals and/or their habitat would have severe population-level effects and compromise the viability of the species, as well as subsistence uses of the species.

4.5 Effects of Alternative 1 – No Action

Where a choice of "no action" by the agency would result in predictable actions by others, this consequence of the "no action" alternative should be included in the analysis (CEQ, Forty Questions, 3.A). NMFS' view is that it is likely an applicant would choose to undertake its action in compliance with the law rather than proceed without an ITA. Under the No Action Alternative, NMFS would not issue the IHA to the POA authorizing take of small numbers of marine mammals. As a result, the exceptions to the prohibition on take of marine mammals per the MMPA would not apply, and the POA would not complete the NES1 project as described in the IHA application. NES1 is a failed structure and has been deemed "globally unstable". It poses significant risk for continued deterioration and structural collapse under the No Action Alternative. If the existing structure were to collapse, there is risk of a significant release of impounded fill material directly impacting marine mammal habitat in the vicinity of the POA. However, this habitat is generally not considered high quality habitat and it would be very localized to the NES site. Therefore, the marine mammal species and their habitat conditions would remain substantially similar to the condition described in Chapter 3.

4.6 Effects of Alternative 2 – Issuance of the Authorization

The following sections describe the environmental consequences of the Preferred Alternative. For each section, the type of impact is defined; the duration, geographic extent, and significance are identified; and an adverse or beneficial qualifier is applied (Table 9). Potential impacts are often reduced through mitigating measures. CEQ regulations (40 CFR 1508.1(s)) define mitigation as:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments

Mitigating measures for the proposed construction activities are presented in Sections 2.2.4 and 2.4.1. However, not all adverse impacts can be mitigated below the levels analyzed in this document. The environmental activities described in Section 2.2 and their associated levels of impacts described in Section 4.6 are the maximum level of adverse impact for projects that will receive NEPA compliance through this analysis. Additional NEPA analysis will be completed if the proposed project has adverse effects that are beyond the scope of those analyzed here, including adverse effects that are significant.

Table 9. Summary of Terms Used to Describe Potential Environmental Impacts

Type of Impact	Duration of Impact	Geographic Extent	Significance	Qualifier
No Effect Direct Indirect Cumulative	Short-term Long-term Permanent	Localized Beyond Project Site	Negligible Minor Moderate Major	Adverse Beneficial

4.6.1 Impacts on Marine Mammal Habitat

Removal of the North Extension bulkhead and impounded fill would result in restoration of subtidal and intertidal habitats that were lost when that structure was constructed in 2005 to 2011. Removal of approximately 1.35 million CY of fill material from below the high tide line would re-create approximately 13 acres of intertidal and subtidal habitat, returning them to their approximate original slope and shoreline configuration. The NES1 Project area has not been considered to be high-quality habitat for marine mammals or marine mammal prey, such as fish, and it is anticipated that removal of the North Extension bulkhead would increase the amount of available habitat for both marine mammals and fish (their prey) because they would be able to swim through the water that would be present in the area at higher water levels. The area would be of higher quality to marine mammals and fish as it returns to its natural state and is colonized by marine organisms.

The NES1 Project would result in direct, short-term, localized, minor, adverse impacts to habitats used by marine mammals due to the installation and removal of temporary piles, removal of sheet piles (i.e., within the project footprint), and disposal of material in the Anchorage Harbor Open Water Disposal Site. The footprint of NES1 and the disposal site would be located in an area that has been highly modified by industrial activity, including annual dredging and disposal. Therefore, the baseline condition is poor-quality marine mammal habitat. The Project area experiences high levels of vessel traffic and relatively high underwater and in-air noise levels. The Project area is not considered high-quality habitat for marine mammals or marine mammal prey, such as fish, so these impacts, while adverse, will be minor. Additionally, it would not result in permanent impacts to designated critical habitat for beluga whales, as the temporary piles would be installed and removed and the sheet piles would be removed in the critical habitat exclusion zone surrounding the POA. Although the waters around the POA are excluded from designated critical habitat, underwater noise from the installation and removal of temporary piles and the removal of sheet piles would be perceptible in designated critical habitat beyond the exclusion zone. Section 7 consultation under the ESA requires an analysis of potential impacts on critical habitat; therefore, additional information on potential effects to designated critical habitat for Cook Inlet beluga whales will be included in the BiOp for the NES1 Project.

The proposed NES1 Project would result in direct, short-term, localized, minor, and adverse changes in the acoustic environment in Knik Arm during in-water construction activities. Noise levels in water would increase during the installation and removal of temporary piles and the removal of sheet piles. Depending on the pile size, pile type, and method of installation or removal, noise levels that could harass marine mammals to the level of take under the MMPA are generally limited to tens of m to approximately 6.9 km (3.7 nautical miles).

Temporary piles will be installed with a vibratory hammer. Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound than impact hammers. Peak SPLs may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman et al. 2009). Rise time associated with the use of a vibratory hammer is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards 2002; Carlson et al. 2005). In contrast, sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper 2005).

Currently, no criteria exist to evaluate underwater noise impacts to fish, marine mammal's prey, from a vibratory hammer. However, since vibratory hammers do not produce impulsive noise, and SSLs are lower than those produced from an impact hammer, it is not expected that in-water pile installation or removal for NES1 will affect local fish species. If an impact hammer is used to dislodge a pile, impacts to fish may be more meaningful as fish have been shown to potentially react to low-frequency, impulsive sounds, such as those produce by impact driving. However, the use of impact pile driving would be limited to situations when sheet piles remain seized in the sediments and cannot be loosened or broken free with a vibratory hammer. The use of an impact hammer to dislodge piles is expected to be uncommon thus any impact to fish would be minor and impacts to marine mammals are not anticipated. Additionally, in-water pile installation and removal would be intermittent and temporary, further reducing the potential for impacts on fish, and ultimately marine mammals.

Once the installation and removal of temporary piles and the removal of sheet piles has ceased and construction of NES1 is complete, habitat quality would be expected to return to pre-NES1 Project conditions or better because of the re-creation of 13 acres of subtidal and intertidal habitats, which are expected to return to their natural state as they are colonized by marine organisms, including fish.

NES1 is not anticipated to impede migration of adult or juvenile salmon or to adversely affect the health and survival of the affected species at the population level. Potential effects on fish would be similar to those discussed in more detail in the NES1 EFH Technical Report (POA 2023a).

Marine mammal habitat would experience direct, short-term, localized, minor, and adverse displacement of marine mammal prey at and near the POA during construction of NES1 due to turbid conditions from temporary disturbance to the immediate substrate area during pile installation as well as removal and disposal of dredged material in the Anchorage Harbor Open Water Disposal Site. However, the area around the POA is not a primary foraging area for marine mammals. Effects of any prey displacements are not expected to affect the overall fitness of marine mammal populations; effects would be minor and terminate after completion of NES1 Project construction.

Temporary pile installation and removal, as well as sheet pile removal, may directly increase turbidity that results from suspended sediments during construction of NES1. Any increases, while adverse, would be short-term, localized, and minor. Knik Arm is a highly turbid environment with a high load of suspended sediments; regardless, the POA must comply with State of Alaska water quality standards during these operations by limiting the extent of turbidity to the immediate Project area. In general, turbidity associated with pile installation is localized to an approximate 25-ft radius around the pile (Everitt et al. 1980). Cetaceans are not expected to be close enough to the Project site to experience the effects of turbidity above baseline, and any pinnipeds transiting the area could avoid localized areas of turbidity. Therefore, the impact on marine mammals from increased turbidity levels is expected to be minor.

The disposal of material from the NES1 Project is anticipated to be intermittent, with a period of hours or days between barge disposal events and no disposal at nighttime. Turbidity levels from suspended sediments are anticipated to return to background levels in durations of 18 minutes to 3 hours, depending on tides (McPherson and Beebee 2023). Impacts on zooplankton, fish, and marine mammals, including Cook Inlet beluga whales, are anticipated to be short-term, intermittent, and minor, if impacts occur at all. Beluga whales and other species that inhabit upper Cook Inlet and Knik Arm are adapted to an environment that is highly variable and experiences high turbidity levels. Negative impacts on marine species, including beluga whales, from turbidity associated with disposal of dredged materials are not anticipated.

In summary, due to the relatively small area of the habitat affected and short duration of the Project, impacts on marine mammal habitat are not expected to cause significant or long-term adverse consequences for individual marine mammals or their populations, including Cook Inlet beluga whales.

The greatest long-term impact on marine mammals associated with the NES1 Project will be a permanent increase in potential habitat because of the removal of the North Extension bulkhead, restoring access of the area to marine mammals and fish

More information on potential impacts to marine mammal habitat is contained in the POA's IHA application (POA 2023a), the Biological Assessment (POA 2023d), the FRN of the proposed IHA (88 FR 76576, 6 November 2023) and the BiOp (15 December 2023; NMFS 2023). The final IHA, if issued, would contain the information regarding potential impacts on marine mammal habitat developed through the consultation and authorization processes and summarized in the Final EA.

4.6.2 Impacts on Marine Mammals

Acoustic stimuli associated with pile installation and removal during construction of the proposed NES1 Project have the greatest potential to directly and adversely affect marine mammals. The effects of sounds from pile installation and removal on marine mammals might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, temporary or permanent hearing impairment, and non-auditory physical effects (Richardson et al. 1995a). The duration, geographic extent, and significance of these impacts are dependent on several factors, including marine mammal context (e.g., age, size, depth of the animal during exposure); the energy needed to install or remove the pile, which is related to hammer type, pile size, depth driven, and substrate; the standoff distance between the pile and receiver; received levels and frequencies; and the sound propagation properties of the environment.

Impacts on marine mammals from pile installation and removal are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The farther away from the source, the less intense the exposure to noise should be. The substrate and depth of habitat also affect the sound propagation properties of the environment. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. Additionally, substrates that are soft (e.g., sand) absorb or attenuate the sound more readily than hard substrates (e.g., rock), which may reflect the acoustic wave. Soft, porous substrates also likely require less time to install the pile, and possibly less forceful equipment, which ultimately decreases the intensity of the acoustic source.

Impacts on marine mammals are also possible through the release of pollutants into the water column from the disposal of contaminated fill or the disturbance of existing contaminants in marine sediments. The risk of contaminated fill being dumped at the Anchorage Harbor Open Water Disposal Site will be mitigated by testing the fill material prior to disposal. Fill material would be tested for contaminants (e.g., trace metals, per- and polyfluorinated alkyl substances) and must measure below a regulatory threshold prior to being disposed in water or on land (USACE 2021).

4.6.2.1 Threshold Shifts: Permanent and Temporary

In general, noise has the potential to induce hearing threshold shifts if the energy accumulated by the received level exceeds the thresholds necessary to do so. The accumulation of energy is a function of the source level, received level, and duration of exposure. NMFS defines a noise-induced threshold shift 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 2018a). 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 2018a). Available data from humans and other terrestrial mammals indicate that a 40-dB threshold shift approximates PTS onset (see NMFS 2018a for review). NMFS defines temporary threshold shift (TTS) as a temporary (short-term), 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 2018a). Based on data from cetacean TTS measurements (see Southall et al. 2007, 2019), 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 (Finneran et al. 2000, 2002, Schlundt et al. 2000).

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 affect marine mammals, ranging from negligible to major (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 not as many competing sounds are 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. NMFS notes 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 NMFS can infer that strategies exist for coping with this condition to some degree, though likely not without cost. Therefore, the impacts resulting from direct exposure to the proposed pile driving will vary depending on the level of threshold shift an animal experiences (i.e., no hearing shifts may represent short-term, localized, negligible, adverse impacts; TTS may represent short-term, localized, minor, adverse impacts; and PTS may represent permanent, localized, moderate, adverse impacts).

4.6.2.2 Behavioral Harassment

Behavioral disturbance may include a variety of adverse effects, including subtle changes in behavior (e.g., minor or brief avoidance of an area or changes in vocalizations); more conspicuous changes in similar behavioral activities; and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Disturbance may result in changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); and/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. 1995a; Wartzok et al. 2003; Southall et al. 2007, 2019; Weilgart 2007; Archer et al. 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison et al. 2012), and can vary depending on characteristics associated with the sound source (e.g., whether it is moving or stationary, number of sources, distance from the source). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans.

Numerous studies have shown that underwater sounds from industry activities are often readily detectable by marine mammals in-water at distances of many km. Studies have also shown that marine mammals at distances of more than a few km often show no apparent response to industry activities of various types (Miller et al. 2005; Bain and Williams 2006). This is often observed, even in cases when sounds must be readily audible to the animals based on measured received levels and hearing sensitivity of that mammal group.

Masking is the obscuring of sounds of interest by other sounds, often at similar frequencies. Marine mammals are highly dependent on sound, and their ability to recognize sound signals amid other noise is important in communication; predator and prey detection; and, in the case of toothed whales, echolocation. Although some degree of masking is inevitable when high levels of human-made broadband sounds are introduced into the ocean, marine mammals have evolved systems and behaviors that function

to reduce the impacts of masking. Structured signals, such as the echolocation click sequences of small, toothed whales, may be readily detected even in the presence of strong background noise because their frequency content and temporal features usually differ strongly from those of the background noise (Au and Moore 1988, 1990). The components of background noise that are similar in frequency to the sound signal in question primarily determine the degree of signal masking. Masking effects of underwater sounds from the POA's proposed activities on marine mammal calls and other natural sounds are anticipated to be limited.

Evidence exists of other marine mammal species continuing to call in the presence of industrial activity. Annual acoustic monitoring near BP Exploration (Alaska) Inc.'s Northstar production facility during the fall bowhead whale (*Balaena mysticetus*) migration westward through the Beaufort Sea has recorded thousands of calls each year (Richardson et al. 1995b; Aerts and Richardson 2008). Construction, maintenance, and operational activities have been occurring at this facility for decades. To compensate for and reduce masking, some baleen whales may alter the frequencies of their communication sounds (Richardson et al. 1995a; Parks et al. 2007). The echolocation clicks produced by the aforementioned marine mammals are usually far above the frequency range of the sounds produced by pile installation and other construction sounds (e.g., dredging, gravel fill). Blackwell (2005) and URS (2007) reported that background noise at the POA (physical environment and maritime operations) contributed more to received levels than pile installation did at distances greater than 1,300 m from the source, which is slightly smaller than the Level B harassment zone for impact installation of unattenuated piles.

Pile installation and removal operations could result in temporary, localized masking through overlapping frequencies of the marine mammal signals or by increasing sound levels such that animals are unable to detect important signals over the increased noise. A passive acoustic study in the MTRP construction vicinity in 2009 measured the frequencies of noise produced as less than 10 kHz, with one exception of impact pile installation, which extended to 20 kHz (Širović and Kendall 2009).

Kendall and Cornick (2016) provide a comprehensive overview of 4 years of scientific marine mammal monitoring conducted during the POA's Expansion Project. Observations were made independently of pile installation (i.e., PSOs were not construction-based and did not have shutdown responsibilities). The authors investigated beluga whale behavior before and during pile installation at the POA. Sighting rates, mean sighting duration, behavior, mean group size, group composition, and group formation were compared between the two periods. A total of approximately 2,329 hours of sampling effort was completed across 349 days from 2005 to 2009. Overall, 687 beluga whales in 177 groups were documented during the 69 days that beluga whales were sighted. A total of 353 and 1,663 hours of pile installation took place in 2008 and 2009, respectively. There was no relationship between monthly beluga whale sighting rates and monthly pile installation rates ($r = 0.19$, $p = 0.37$). Sighting rates before ($n = 12$; 0.06 ± 0.01) and during ($n = 13$; 0.01 ± 0.03) pile installation were not significantly different. However, sighting duration of beluga whales decreased significantly during pile installation (39 ± 6 minutes before and 18 ± 3 minutes during).

Significant differences in behavior were detected before versus during pile installation. Beluga whales primarily traveled through the study area both before and during pile installation; however, traveling increased relative to other behaviors during pile installation. S Documentation of milling (i.e., non-directed movement) began in 2008 and was observed on 21 occasions. No acute behavioral responses were documented. Mean group size decreased during pile installation; however, this difference was not statistically significant. In addition, group composition was significantly different before and during pile driving, with more white (i.e., likely older) animals being present during pile driving (Kendall and Cornick, 2015). Cook Inlet beluga whales were primarily observed densely packed before and during pile driving; however, the number of densely packed groups increased by approximately 67 percent during pile driving. There were also significant increases in the number of dispersed groups (approximately 81

percent) and lone white whales (approximately 60 percent) present during pile driving than before pile driving (Kendall and Cornick, 2015).

During the PCT and SFD project construction monitoring, no definitive behavioral reactions to the in-water activity or avoidance behaviors were documented (61N Environmental, 2021, 2022a, 2022b). However, potential reactions (where a group reversed its trajectory shortly after the start of in-water pile driving occurred; a group reversed its trajectory as it got closer to the sound source during active in-water pile driving; or upon an initial sighting, a group was already moving away from in-water pile driving, raising the possibility that it had been moving towards, but was only sighted after they turned away) and instances where beluga whales moved toward active in-water pile driving were recorded. During these instances, impact driving appeared to cause behavioral reactions more readily than vibratory hammering (61N Environmental, 2021, 2022a, 2022b). One minor difference documented during PCT construction was a slightly higher incidence of milling behavior and diving during the periods of no pile driving and slightly higher rates of traveling behavior during periods when beluga whales were potential disturbed by pile driving (61N Environmental, 2021, 2022a). In general, beluga whales were more likely to display no reaction or continue to move toward the PCT or SFD during pile installation and removal.

Acoustically, Saxon-Kendall et al. (2013) recorded echolocation clicks (which can be indicative of feeding behavior) during the MTR Project at the POA both while pile driving was occurring and when it was not. This indicates that while feeding is not a predominant behavior observed in beluga whales sighted near the POA (61N Environmental, 2021, 2022a, 2022b, 2022c; Easley-Appleyard and Leonard, 2022) Beluga whales can and still exhibit feeding behaviors during pile driving activities. In addition, Castellote et al. (2020) found low echolocation detection rates in lower Knik Arm (i.e., Six Mile, Port MacKenzie, and Cairn Point) and suggested that beluga whales moved through that area relatively quickly when entering or exiting the Arm. No whistles or noisy vocalizations were recorded during the MTR construction activities; however, it is possible that persistent noise associated with construction activity at the MTR project masked beluga vocalizations and or that beluga whales did not use these communicative signals when they were near the MTR Project (Saxon-Kendall et al., 2013).

During marine mammal monitoring efforts for geotechnical sampling for the Seward Highway Milepost 75 to 90 (along Turnagain Arm) Project, beluga whales were observed on 15 of the 16 days of monitoring at Twentymile Bridge from 06 to 23 April 2015. Even though no in-water work occurred at night (at Twentymile Bridge), roadway flaggers present throughout the night indicated that they could hear beluga whales at the bridge site during nighttime hours. During the 2015 season, there were 18 observations of beluga whale groups, ranging in size from 3 to 30. Shutdowns typically occurred when beluga whales were at the mouth of Twentymile River to ensure that the animals did not enter the harassment zone during in-water geotechnical sampling (HDR 2015). These data indicate that beluga whales may use areas near marine construction projects when in-water work is not occurring.

NMFS anticipates that disturbance to beluga whales would manifest in the same manner when they are exposed to noise during the NES1 Project: whales may move quickly and silently through the area. NMFS does not anticipate that beluga whales would abandon entering or exiting Knik Arm, as this is not evident based on previous years of monitoring data (e.g., Kendall and Cornick 2016; 61N Environmental 2021), and the pre-pile driving clearance mitigation measure is designed to further avoid any potential abandonment. Therefore, behavioral impacts resulting from the proposed pile driving represent a short-term, localized, negligible, adverse, direct impact on beluga whales and other marine mammals in the NES1 Project area.

4.6.2.3 Applicable Noise Criteria and Take Estimates

Noise Criteria and Source Sound Levels

The POA relied on the NMFS Technical Guidance for assessing Level A harassment and relied on NMFS interim criteria to assess Level B harassment levels when preparing their application. A summary of PTS

onset acoustic thresholds for assessing Level A harassment, and acoustic criteria for assessing Level B harassment, from exposure to noise from impulsive and non-impulsive underwater sound sources is provided in Table 10.

Table 10. Summary of PTS Onset Acoustic Thresholds for Assessing Level A Harassment, and Acoustic Criteria for Assessing Level B Harassment, of Marine Mammals from Exposure to Noise from Impulsive (Pulsed) and Non-impulsive (Continuous) Underwater Sound Sources

Species Group	PTS Onset Acoustic Thresholds (Received Level)			
	Hearing Group	Impulsive (Pulsed or Intermittent)		Non-impulsive (Continuous)
Level A Harassment				
Cetaceans	LF	$L_{pk,flat}$	219 dB	$L_{E, LF, 24h}$: 199 dB
		$L_{E, LF, 24h}$	183 dB	
	MF	$L_{pk,flat}$	230 dB	$L_{E, MF, 24h}$: 198 dB
		$L_{E, MF, 24h}$	185 dB	
	HF	$L_{pk,flat}$	202 dB	$L_{E, HF, 24h}$: 173 dB
		$L_{E, HF, 24h}$	155 dB	
Pinnipeds	PW pinnipeds	$L_{pk,flat}$	218 dB	$L_{E, PW, 24h}$: 201 dB
		$L_{E, PW, 24h}$	185 dB	
	OW pinnipeds	$L_{pk,flat}$	232 dB	$L_{E, OW, 24h}$: 219 dB
		$L_{E, OW, 24h}$	203 dB	
Level B Harassment				
Cetaceans	LF	160 dB RMS		120 dB RMS or background level
	MF			
	HF			
Pinnipeds	PW pinnipeds			
	OW pinnipeds			

Source: NMFS 2018a, 2020d
Note: HF = high-frequency; PTS = permanent threshold shift; $L_{pk,flat}$ = peak sound pressure level (unweighted); $L_{E,24h}$ = sound exposure level, cumulative 24 hours; LF = low-frequency; MF = mid-frequency; OW = otariid in water; PW = phocid in water; RMS = root mean square

Distance to Sound Thresholds and Areas

Sound propagation and the distances to the sound isopleths defined by NMFS for Level A harassment of marine mammals under the 2018 Technical Guidance were estimated using the NMFS User Spreadsheet (NMFS 2020d; available at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance), which provides simple calculations to estimate cumulative sound exposure levels (SEL_{cum}) and the potential for PTS. As part of our analysis under the MMPA, NMFS computes the distances to isopleths for the different functional hearing groups based on an unweighted sound level with corresponding distance. The model applies simple Weighting Factor Adjustments for the five functional hearing groups and incorporates a duty cycle to account for the number of pile strikes per unit time (NMFS 2018a). The simple spreading loss to account for sound propagation and the distances to the sound isopleths defined by NMFS for onset of PTS and Level B harassment of marine mammals were estimated based on the following:

$$TL = TL_c \log10 (R/D)$$

Where

- TL (transmission loss) is the difference between the reference sound source level (SSL) dB root mean square (rms) and the Level B harassment threshold dB (122.2 dB for vibratory);
- TL_c is the TL coefficient;
- R is the estimated distance to where the sound level is equal to the Level B harassment threshold (122.2 dB for continuous noise and 160 dB for impulsive noise); and
- D is the distance at which the SSL was measured.

The estimated distance to the onset of PTS and Level B harassment isopleths can be calculated by rearranging the terms in the above equation to the following:

$$R = D\ 10^{(TL/TLc)}$$

For estimated distances to the onset of PTS, the SSL is based on the cumulative SEL (SEL_{cum}) over time, which is computed based on the following for vibratory pile driving:

$$SEL_{cum} = SEL + 10\ Log_{10}\ (seconds)$$

And the following for impact pile driving:

$$SEL_{cum} = \text{Single-Strike SEL} + 10\ Log_{10}\ (\text{number of events})$$

Where number of events is expressed as seconds for vibratory pile driving or pile strikes for impact pile driving.

These models were used to predict distances to underwater sound levels generated by pile installation and removal for the NES1 Project.

Level A harassment zones for use of a vibratory hammer on temporary stability template piles and all combinations of functional hearing group, pile size, and number of piles per day, and for up to 2 hours of sheet pile removal per day, are smaller than or equivalent to the shutdown zones (Table 5) that would be implemented by the POA during pile installation and removal. Use of an impact hammer to loosen sheet pile is expected to occur rarely. If it occurs, Level A harassment zones for use of an impact hammer on sheet piles will also be smaller than the shutdown zones. Efforts would be made to avoid Level A harassment take for all species; however, 13 Level A harassment takes of harbor seals, and 2 Level A takes of harbor porpoises are proposed to be authorized.

The primary sound-generating activity associated with the NES1 Project would be vibratory removal of sheet piles. Data for removal of sheet piles are limited but it is expected that, typically, sound levels during vibratory sheet pile installation and removal are similar. Sound levels produced by vibratory removal of sheet piles for this Project are likely to be quieter than those produced by installation because the preceding excavation of the surrounding sediments is intended to reduce frictional forces exerted on the piles, specifically to reduce the power required for sheet pile removal so they do not tear or break off (Appendix A of the IHA). Preceding excavation will also make pile removal quieter. Additionally, some sheet piles may be loosened in the sediments with a small number of strikes from an impact hammer, which would also reduce friction and reduce the duration of vibratory hammer use.

Underwater sound was measured in 2008 at the Port of Anchorage (now the Port of Alaska) for the MTRP during installation of sheet piles to assess potential impacts of sound on marine species. Sound levels for installation of sheet piles measured at 10 m typically ranged from 147 to 161 dB RMS, with a mean of approximately 155 dB RMS (James Reyff, unpublished data). An SSL of 162 dB RMS was reported in California Department of Transportation (CALTRANS; CALTRANS 2020) summary tables for 24-inch steel sheet piles. This is a more rigid type of sheet pile that requires a large vibratory driver

(James Reyff, personal communication, 26 August 2020). Based on the 2008 measurements at the POA and the CALTRANS data, a value of 160 dB RMS was assumed for vibratory removal of sheet pile (Table 11). NMFS has concurred that this value is an acceptable proxy for other projects in Cook Inlet, Alaska (e.g., 85 FR 673).

Table 11. Estimates of Unweighted Underwater Sound Levels Generated during Pile Installation and Removal

Method and Pile Type	Unweighted Sound Level at 10 Meters				
Vibratory Hammer	**dB RMS**			**TL Coefficient**	**Data Source for Sound Levels**
Sheet pile (hammer or splitter)	160			16.5[a]	CALTRANS 2015, 2020
24-inch steel installation	161				U.S. Navy 2015
24-inch steel removal	169				Coleman 2011; I&R 2017, 2021, 2023;
36-inch steel installation	166				U.S. Navy 2015
36-inch steel removal	159				U.S. Navy 2012; I&R 2021a, 2023
Impact Hammer	**dB RMS**	**dB SEL**	**dB peak**	**TL Coefficient**	**Data Source for Sound Levels**
Sheet pile	189	179	205	15.0[b] (RMS) 15.0[b] (SEL)	CALTRANS 2020

[a] Austin et al. 2016.
[b] NMFS default value (Practical Spreading Loss)
Notes: CALTRANS = California Department of Transportation; dB = decibels; I&R = Illingworth and Rodkin, Inc.; rms = root-mean-square; SEL = sound exposure level; TL = transmission loss.

Impact removal is the process of hitting a pile with an impact hammer with a small number of strikes (up to 50 per pile) to loosen it from the soil so that it can be removed via other means such as direct pulling or with a vibratory hammer. There are no data to our knowledge available on impact removal of this nature. The POA proposed to use SPL values measured during the impact installation of 24-inch (61-cm) AZ steel sheet piles from the Berth 23, Port of Oakland Project (CALTRANS, 2020) for this activity. Without additional data, NMFS accepted the POA's proposed SPLs for this activity.

The POA proposed to use project- and site-specific SSLs for unattenuated vibratory removal of 24- and 36-inch temporary stability template piles as collected during PCT 2020 construction and reported in I&R (2021a). However, given the limited project- and site-specific data available for this source, NMFS chose to evaluate all available data related to unattenuated vibratory removal of 24-inch and 36-inch steel pipe piles, including data submitted by the POA and measured during the PCT Project. NMFS considered available data from publicly available reports that reported driving conditions and specified vibratory removal for certain piles. If vibratory removal was not specifically noted for a given pile, it was excluded from the analysis. Mean RMS SPLs were converted into pressure values, and pressure values for piles from each project were averaged to give a single value for each project. The calculated project means were then averaged and converted back into units of decibels to give a single recommended SPL (rounded to the nearest whole dB) for each pile type.

For 24-inch pile removal, NMFS included 10 pile measurements: 3 from Columbia Crossing in Oregon (Coleman 2011); 5 from Joint Expeditionary Base Little Creek in Norfolk, Virginia (I&R 2017); and 2 from the PCT Project at the POA (I&R 2021a, 2023). NMFS calculated an average SPL for vibratory removal of 24-inch steel pipe piles of 169 dB RMS (Table 11).

For 36-inch pile removal, NMFS included 40 pile measurements: 38 from the U.S. Navy Test Pile Program at Naval Base Kitsap in Bangor, Washington (Navy 2012), and 2 from the PCT project at the POA (I&R 2021, 2023). NMFS calculated an average SPL for vibratory removal of 36-inch steel pipe piles of 159 dB RMS (Table 11).

Interestingly, the RMS SPLs for the unattenuated vibratory removal of 24-inch piles was much louder than the unatteunated vibratory removal of 36-inch piles, and even louder than the unattenuated vibratory installation of 24-inch piles. I&R (2023) suggest that at least for data recorded at the POA, the higher 24-inch removal levels are likely due to the piles being removed at rates of 1,600 to 1,700 revolutions per minute (rpm), while 36-inch piles, which are significantly heavier than 24-inch (piles), were removed at a rate of 1,900 rpm. The slower rates combined with the lighter piles would cause the hammer to easily "jerk" or excite the 24-inch piles as they were extracted, resulting in a louder rattling sound and louder sound levels. This did not occur for the 36-inch piles, which were considerably heavier due to increased diameter, longer length, and greater thickness.

The TL coefficient used for vibratory pile installation and removal is 16.5 as measured during the 2016 TPP (Austin et al. 2016). The NMFS default value of 15.0, which assumed practical spreading loss, is used for impact pile installation. See Table 11 and Appendix A of the IHA application for more detail. The resulting isopleths and harassment areas are reported in Table 12.

Table 12. Calculated Distance and Areas of Level A and Level B Harassment Per Pile Type and Pile Driving Method

Activity	Pile Type / Size	Level A harassment distance (m)					Level B harassment distance (m) all hearing groups	Level B harassment area (km^2) all hearing groups
		LF	MF	HF	PW	OW		
Impact Removal	Sheet pile	153	6	182	82	6	858	1.44
Vibratory Installation	24-inch (61-cm)	14	2	20	9	1	2,247	8.39
	36-inch (91-cm)	28	4	40	18	2	4,514	26.13
Vibratory or Splitter Removal	Sheet pile	10	1	14	6	1	1,954	6.47
Vibratory Removal	24-inch (61-cm)	42	5	60	27	3	6,861	37.64
	36-inch (91-cm)	11	2	15	7	1	1,700	4.99

Estimated Take of Marine Mammals

Potential estimates of take, pursuant to the analysis required under the MMPA, were derived based on the data available and the expected frequency of observing the species during the NES1 Project. To estimate take, numbers of marine mammals are rounded up to the nearest integer, because a fraction of a marine mammal cannot be exposed to noise or taken. Calculations used to estimate exposure from pile installation for all marine mammals are described below. NMFS notes that the estimated take does not necessarily equate to individual animals (i.e., the same harbor seal may be exposed on different days).

Gray Whales

Sightings of gray whales in the Project area are rare, and the potential risk of exposure of a gray whale to sounds exceeding the Level B harassment threshold is low. Few, if any, gray whales are expected to approach the Project area. However, based on three separate sightings of single gray whales near the POA

in 2020 and 2021 (61N Environmental 2021, 2022a; Easley-Appleyard and Leonard 2022), it is anticipated that exposure of up to six individuals could occur during the NES1 Project. Therefore, NMFS has proposed to authorize 6 takes by Level B harassment for gray whales. This direct, short-term, localized potential exposure is expected to have a negligible adverse effect on an individual animal and no effect on humpback whale populations as a whole. This could include three cow-calf pairs or six sightings of single gray whales. Takes by Level A harassment gray whales are not anticipated or requested.

Humpback Whales

Sightings of humpback whales in the Project area are rare, and the potential risk of exposure of a humpback whale to sounds exceeding the Level B harassment threshold is low. Few, if any, humpback whales are expected to approach the Project area. However, there have been two humpback whale sightings within a single year of monitoring (one sighting of two individuals and one sighting of one individual) (ABR, Inc. 2017). Therefore, NMFS anticipates that up to four individuals (up to two pairs) could occur during in-water pile installation and removal for the NES1 Project and is proposing to authorize four takes by Level B harassment for humpback whales. This direct, short-term, localized potential exposure is expected to have a negligible adverse effect on an individual animal and no effect on humpback whale populations as a whole. No Level A harassment take for humpback whales is anticipated or requested.

Harbor Seals

No known harbor seal haulout or pupping sites occur in the vicinity of the POA; therefore, exposure of harbor seals to in-air noise is not considered, and no take for in-air exposure was requested by the POA. Harbor seals are not known to reside in the Project area, but they are seen regularly near the mouth of Ship Creek from July through September when Pacific salmon are running. With the exception of newborn pups, all ages and sexes of harbor seals could occur in the Project area. Any harassment of harbor seals during in-water pile installation and removal would involve a limited number of individuals that may potentially swim through the Project area or linger near Ship Creek. Harbor seals that are disturbed by noise may alter their behavior (e.g., modify foraging patterns) and be temporarily displaced from the Project area.

Marine mammal monitoring data were used to examine hourly sighting rates for harbor seals in the Project area. Sighting rates of harbor seals were highly variable and appeared to have increased during monitoring between 2005 and 2022. It is unknown whether any potential increase was due to local population increases or habituation to ongoing construction activities. The highest individual hourly sighting rate recorded for a previous year (rounded) was used to quantify take of harbor seals for in-water pile installation and removal associated with the NES1 Project. This occurred in 2021 during PCT Phase 2 construction, when harbor seals were observed from May through September. A total of 220 harbor seals were observed over 734.9 hours of monitoring, at an average rate of 0.2994 harbor seal sighting per hour. The maximum monthly sighting rate occurred in September and was 0.51 harbor seal per hour. Based on these data, it is estimated that approximately one harbor seal (0.51 rounded up) may be observed near the Project per hour of hammer use. This approximate sighting rate of one harbor seal per hour was also used for harbor seal exposure calculations for the SFD Project (86 FR 31870). During the 246.5 hours of anticipated in-water pile installation and removal, it is estimated that up to 247 harbor seals (1 harbor seal per hour * 246.5 hours = 246.5 harbor seals, rounded up to 247) may potentially be exposed to in-water noise levels exceeding the Level B harassment thresholds for in-water pile installation and removal during the NES1 Project.

It is possible that a single harbor seal may linger near the POA, especially near Ship Creek, and be counted multiple times each day as it moves around and resurfaces in different locations. The number of harbor seals actually taken would, therefore, likely be smaller than the number of potential exposures that is reported.

Harbor seals often are curious about onshore activities and may choose to approach closely. The mouth of Ship Creek, where harbor seals linger, is approximately 2,500 m from the southern end of the NES1 Project and is therefore far outside the Level A harassment zones calculated for harbor seals. However, given the potential difficulty of tracking individual harbor seals for hours and their consistent low-level use of the POA area, NMFS anticipates the potential for some take by Level A harassment for harbor seals. For SFD, NMFS authorized 8.6 percent of estimated harbor seal takes as potential Level A harassment (86 FR 31870) based on the proportion of previous harbor seal sightings within the estimated Level A harassment zones, but the NES1 Project is more distant from Ship Creek than SFD, and minimal impact hammering is anticipated which results in the largest Level A harassment distance (82 m). NMFS therefore anticipates that a smaller proportion of Level A exposures would occur during the NES1 Project, and proposes to reduce the percentage to 5 percent. Therefore, NMFS proposes to authorize 13 harbor seal (5 percent of 247 exposures) takes by Level A harassment and 234 (247 potential exposures minus 13) takes by Level B harassment, for a total of 247 takes.

Exposure is anticipated to be further minimized because pile installation and removal would occur intermittently over the construction period. Few harbor seals are expected to approach the Project area, and this small number of direct, short-term, localized potential exposures is anticipated to have a negligible adverse effect on the population as a whole.

Steller Sea Lions

Steller sea lions are anticipated to be encountered in low numbers in the Project area (Section 3.2.2.1). Similar to the approach used above for harbor porpoises, the POA used previously recorded sighting rates of Steller sea lions near the POA to estimate requested take for this species. During SFD construction in May and June of 2022, the hourly sighting rate for Steller sea lions was 0.028. The hourly sighting rate for Steller sea lions in 2021, the most recent year with observations across most months, was approximately 0.01. Given the uncertainty around Steller sea lion occurrence at the POA and potential that occurrence is increasing, the POA estimated that approximately 0.06 Steller sea lions per hour (the May and June 2022 rate of 0.028 Steller sea lions per hour doubled) may be observed near the proposed NES1 project areas per hour of hammer use. With 246.5 hours of in-water pile installation and removal, the POA estimates that 15 Steller sea lions (0.06 sea lions per hour * 246.5 hours = 14.79 sea lions rounded up to 15) could be within estimated harassment zones during NES1 project activities. However, the highest number of Steller sea lions that have been observed during the 2020-2022 monitoring efforts at the POA was nine individuals (eight during PCT Phase 1 monitoring and one during NMFS 2021 monitoring). Given the POA's estimate assumes a higher Steller sea lion sighting rate (0.06) than has been observed at the POA and results in an estimate that is much larger than the number of Steller sea lions observed in a year, NMFS believes that the 15 estimated takes requested by the POA overestimates potential exposures of this species. NMFS instead proposed nine Steller sea lions takes by Level B harassment for the NES1 project.

It is unlikely that a Steller sea lion would enter the small (6 m) Level A harassment zone during pile driving. However, a Steller sea lion popped up within an estimated Level A harassment zone next to a work skiff during the Test Pile Program in 2016. Pile driving was not occurring at the time the animal was observed and a brief observation of an animal within a Level A harassment zone does not necessarily mean the animal experienced Level A harassment (other factors such as duration within the harassment zone need to be taken into consideration). However, to take such occurrences into account, the POA requested an additional two exposures of Steller sea lions to Level A harassment, for a total of 17 exposures (15 Level B and 2 Level A exposures). However, given the small Level A harassment zone and the required mitigation and monitoring measures, including shutdown zones that are larger than the Level A harassment zone, NMFS believes it is unlikely that a Steller sea lion would be within the estimated Level A harassment zone for sufficient duration to incur PTS and it therefore not proposing to authorize any takes by Level A harassment.

Similar to harbor seals, exposure is anticipated to be further minimized because pile installation and removal will occur intermittently over the construction period. Few Steller sea lions are expected to approach the Project area, and this small number of direct, short-term, localized potential exposures is anticipated to have a negligible adverse effect on the population as a whole.

Harbor Porpoises

Monitoring data recorded from 2005 through 2022 were used to evaluate hourly sighting rates for harbor porpoises in the Project area. During most years of monitoring, no harbor porpoises were observed. However, there has been an increase in harbor porpoise sightings in upper Cook Inlet over the past 2 decades (Shelden et al. 2014). The highest sighting rate for any recorded year during in-water pile installation and removal was an average of 0.037 harbor porpoises per hour during PCT construction in 2021, when observations occurred across most months. Given the uncertainty around harbor porpoise occurrence at the POA and potential that occurrence is increasing, it is estimated that approximately 0.07 harbor porpoises per hour (the 2021 rate of 0.037 harbor porpoises per hour doubled) may be observed near the Project per hour of hammer use. With 246.5 hours of in-water pile installation and removal, NMFS estimates that there could be 18 instances of take for harbor porpoises (0.07 harbor porpoises per hour * 246.5 hours = 17.3 harbor porpoises rounded up to 18 harbor porpoises).

Harbor porpoises move quickly and can be difficult to detect and track. To account for the possibility that a harbor porpoise could enter a Level A harassment zone, it is assumed that 5 percent of estimated harbor porpoise takes could be by Level A harassment. Therefore, NMFS proposes that one harbor porpoise (5 percent of 18 exposures) potentially could be exposed to Level A harassment. In total, NMFS proposes to authorize 1 take by Level A harassment and 17 takes by Level B harassment for harbor porpoises, for a total of 18 instances of take.

With in-water pile installation and removal occurring intermittently over the construction period, the potential for exposure within the Level B harassment isopleths is anticipated to be low. Few harbor porpoises are expected to approach the Project area, and the small number of takes (18 harbor porpoises) requested and the direct, short-term, localized potential exposure is expected to have a negligible adverse effect on individual animals and no measurable effect on the population as a whole.

Killer Whales

Numbers of resident and transient killer whales in upper Cook Inlet are very small in comparison with their overall population sizes. Few, if any, killer whales are expected to approach the Project area. No killer whales were sighted during previous monitoring programs for POA construction projects, including the 2016 TPP, 2020 and 2021 PCT, and 2022 SFD projects (Prevel-Ramos et al. 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick et al. 2010, 2011; ICRC 2009, 2010, 2011, 2012; Cornick and Pinney 2011; Cornick and Seagars 2016; 61N Environmental 2021, 2022b). During PCT Project construction in 2021, two killer whales were sighted (61N Environmental 2022a), the first time this species has been documented near the POA. The infrequent sightings of killer whales reported in upper Cook Inlet tend to occur when their primary prey (anadromous fish for resident killer whales and beluga whales for transient killer whales) are also in the area (Shelden et al. 2003). Previous sightings of transient killer whales have documented pod sizes in upper Cook Inlet between one and six individuals (Shelden et al. 2003).

The potential for exposure of killer whales within the Level B harassment isopleths is anticipated to be extremely low. Level B harassment take is conservatively estimated at no more than one small pod (six individuals) for the duration of pile installation and removal. Few killer whales are expected to approach the Project area, and this direct, short-term, localized potential exposure is expected to have a negligible adverse effect on an individual animal and no effect on killer whale populations as a whole. No Level A harassment take for killer whales is anticipated or requested.

Cook Inlet Beluga Whales

Several marine mammal monitoring programs have been conducted at the POA over the last 18 years and Cook Inlet beluga whales are the most commonly encountered marine mammal. The methodology used to conduct marine mammal monitoring programs has evolved and advanced over the last two decades. Due to the changes in monitoring protocol over the years, the monitoring data from earlier years is not always comparable to the most recent data. Likewise, the approach for calculating take has evolved based on the most recent monitoring protocol. Potential exposure of beluga whales to elevated sounds levels from pile installation and removal was calculated following the method outlined below and explained in greater detail in the NES1 IHA application and FRN of the proposed IHA (88 FR 76576, 6 November 2023).

Data Source Considerations

The marine mammal monitoring programs for the PCT and SFD projects produced a unique and comprehensive data set of beluga whale locations and movements (61N Environmental 2021, 2022a, 2022c, Easley-Appleyard and Leonard, 2022) that is the most current data set available for Knik Arm. This data set was used to estimate potential beluga whale exposure to elevated sound levels for the NES1 Project. This data set is most likely to accurately represent future beluga whale attendance at the Project site, which may be affected by beluga whale population size, beluga whale movement patterns through Knik Arm, environmental change including climate change, differences in salmon and other prey abundance among years, and other factors. More details about the data used are provided in the POA's IHA application and the FRN of the proposed IHA (88 FR 76576, 6 November 2023).

Closest Point of Approach (CPOA) Methodology for Calculating Sighting Rates

To calculate monthly sighting rates of Cook Inlet beluga whales, the closest point of approach (CPOA) for each beluga whale group was determined (for details on marine mammal data collection methods, see 61N Environmental 2021, 2022a, 2022c; Easley-Appleyard and Leonard 2022). Piecewise regression, a common tool for modeling ecological thresholds (Lopez et al. 2020; Whitehead 2016, Atwood et al. 2016), detected breakpoints in a cumulative density distribution of the CPOA locations across all calendar months. The distances from the NES1 Project site detected by the breakpoint analysis were used to define five sighting rate distance bins for calculation of beluga whale exposures (takes). Each breakpoint (74, 1,651, 2,808, and 7,368 m, and the complete data set of observations (greater than 7,368 m) was rounded to the nearest m and considered the outermost limit of each sighting rate bin, resulting in five identified bins (Table 13).

Table 13. Beluga Whale Monthly Sighting Rates for Different Bin Sizes

Bin Number	Distance (m)	Beluga Whales/Hour							
		April	May	June	July	August	Sept.	Oct.	Nov.
1	≤ 74	0.09	0.06	0.10	0.04	0.83	0.62	0.51	0.11
2	≤ 1,651	0.25	0.14	0.13	0.06	1.43	1.30	1.15	0.70
3	≤ 2,808	0.36	0.22	0.21	0.07	2.08	1.90	2.04	0.73

4	≤ 7,368	0.67	0.33	0.29	0.13	2.25	2.19	2.42	0.73
5	>7,368	0.71	0.39	0.30	0.13	2.29	2.23	2.56	0.73

Note: m = meters.

To determine the number of takes by Level B harassment required for the project, Level B harassment isopleths were calculated for each pile size and hammer expected to create elevated noise levels. For beluga whales, the monthly sighting rate for each Level B harassment isopleth was determined by identifying the sighting rate distance bin with the corresponding Level B harassment isopleth, and then summing all of the beluga whales sighted within that sighting rate distance bin for each calendar month in all years and dividing by the number of hours of observation for that month in all years, giving beluga whales per hour per month for each sighting rate distance bin (Table 14). The number of hours expected from each activity for each month was then multiplied by the monthly sighting rate to determine the number of beluga whales expected to be seen each month that could potentially be exposed to elevated sound levels during the specified activity.

Beluga Whale Take Estimates

Level B harassment take estimates for Cook Inlet beluga whales were calculated by multiplying the total number of vibratory installation or removal hours per month for each activity based on the anticipated construction schedule with the corresponding sighting rate (beluga whales per hour per month) and sighting rate distance bin (Table 14). Using the monthly activity estimates in hours and monthly beluga whales/hour calculated rate, NMFS estimated that there could be up to 122 (121.2 rounded up to 122) instances of take by Level B harassment for beluga whales (Table 15).

Table 14. Allocation of Each Level B Isopleth to a Sighting Rate Bin and Beluga Whale Monthly Sighting Rates for Different Pile Sizes and Hammer Types

	Level B Isopleth Distance (m)	**Sighting Rate Bin Number (Distance)**	**Beluga Whales/Hour**							
			April	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**
24-inch Vibratory Installation	2,247	3 (2,808 m)	0.36	0.22	0.21	0.07	2.08	1.90	2.04	0.73

24-inch Vibratory Removal	6,860	4 (7,368 m)	0.67	0.33	0.29	0.13	2.25	2.19	2.42	0.73
36-inch Vibratory Installation	4,514	4 (7,368 m)	0.67	0.33	0.29	0.13	2.25	2.19	2.42	0.73
36-inch Vibratory Removal	1,699	3 (2,808 m)	0.36	0.22	0.21	0.07	2.08	1.90	2.04	0.73
Sheet Pile Vibratory Removal	1,954	3 (2,808 m)	0.36	0.22	0.21	0.07	2.08	1.90	2.04	0.73
Observation Hours/Month[a]			87.9	615.1	571.6	246.9	224.5	326.2	109.5	132.0

Note: m = meters.
[a] Observation hours have been totaled from the PCT 2020 and 2021 programs, the NMFS 2021 data collection effort, and the SFD 2022 construction (61N 2021, 2022a, 2022c, and NMFS unpublished data 2021).

Table 15. Beluga Whale Monthly and Total Estimated Level B Take

	April	**May**	**June**	**July**	**August**	**Sept.**	**Oct.**	**Nov.**	**Total**
24-inch Vibratory Installation and Removal	2.4	3.0	1.7	0.6	12.5	6.9	4.0	0.2	31.3
Sheet Pile Removal	3.6	9.9	12.6	4.2	27.0	22.8	8.2	1.5	89.8
Total Estimated Level B Harassment Exposures for All Activities (Rounded Up)									**121.1 (122)**
Total Estimated Level B Harassment Exposures with 59% Correction Factor									**72**

For the PCT and SFD projects, NMFS accounted for the implementation of mitigation measures by applying an adjustment factor to beluga whale take estimates since some Level B harassment takes would likely be avoided based on required shutdowns for beluga whales at the Level B harassment zones (85 FR 19274, 6 April 2020; 85 FR 50057, 7 September 2021). This same approach was taken for the NES1 Project. The adjustment was calculated using the percentage of realized takes for the PCT project (see Table 6-12 in the POA's IHA application). The recent data from PCT Phase 1 and PCT Phase 2 most accurately reflected the current marine mammal monitoring program, the current program's effectiveness, and beluga whale occurrence in the NES1 project area. Between the two phases of the PCT project, 90 total Level B harassment takes were authorized and 53 were potentially realized (i.e., number of beluga whales observed within estimated Level B harassment zones), equating to an overall percentage of 59 percent. The SFD Project, during which only 7 percent of authorized take was potentially realized, represented installation of only 12 piles during a limited time period and does not represent the much higher number of piles and longer construction season anticipated for NES1. Based on these data, NMFS applied a 59 percent adjustment factor to the NES1 take analysis to more accurately account for the efficacy of the POA's marine mammal monitoring program and shutdown protocol. It was therefore assumed that approximately 59 percent of the takes calculated for the NES1 Project will actually be realized. This adjusts the calculated potential exposures of beluga whales from 122 to 72 takes by Level B harassment.

It is possible that large groups of beluga whale could swim by the POA during pile driving activities. For example, up to 53 individuals in a single group were observed by the POA during the PCT project. However, the mean (median, standard deviation) beluga whale group size observed during the 2020 through 2022 POA and NMFS marine mammal monitoring efforts in Knik Arm were 4.28 (3, 4.86)

whales (61N Environmental, 2021, 2022a, 2022b; Easley-Appleyard and Leonard, 2022) and the 95 percentile group size of beluga whales observed during these years was 12.30 individuals. This means that of the 495 documented beluga whale groups in these data sets, 95 percent consisted of fewer than 12.3 whales and 5 percent of the groups consisted of more than 12.3 whales. Therefore, NMFS believes that the 72 takes by Level B harassment proposed for authorization adequately accounts for the possibility of the POA taking multiple pods (or groups) of beluga whales.

No takes by Level A harassment of beluga whales is anticipated or requested. This small number of potential beluga whale exposures to Level B harassment is anticipated to have no measurable effect on individuals or the population as a whole. Based on previous observations of beluga whales during pile driving activities at the POA (e.g., 61N Environmental, 2021, 2022a, 2022b; Easley-Appleyard and Leonard, 2022), NMFS expects that any effects would be limited to Level B harassment consisting of temporary modifications in behavior such as increased swim speeds, tighter group formations, and cessation of vocalizations, but not through the loss of foraging capabilities or abandonment of habitat. NMFS does not anticipate that any of these responses will have an impact on annual rates of recruitment or survival for individuals or the population.

Table 16 provides a summary of all marine mammal exposures that are proposed to be authorized for the NES1 Project. The analysis of pile installation and removal associated with the NES1 Project predicts potential exposures of marine mammals to noise from vibratory pile installation and removal that could be classified as Level A and Level B harassment under the MMPA. No Level A harassment take is requested for Steller sea lions, killer whales, beluga whales, or humpback whales.

Table 16. Summary of All Marine Mammal Exposures Requested by Species

Species	Stock/DPS	Level A Harassment Exposures	Level B Harassment Exposures	Species Total	Abundance	Percent of Population[a]
Harbor seal	Cook Inlet/Shelikof Strait	13	234	247	28,411	0.87

Species	Stock/DPS	Level A Harassment Exposures	Level B Harassment Exposures	Species Total	Abundance	Percent of Population[a]
Steller sea lion	Western DPS	0	9	9	52,932	0.02
Harbor porpoise	Gulf of Alaska	1	17	18	31,046	0.06
Killer whale	Resident	0	6	6	1,920	0.31[b]
	Transient				587	1.02[b]
Beluga whale	Cook Inlet	0	72	72	331	21.75
Gray whale	Eastern North Pacific	0	6	6	29,960	0.02[b]
Humpback whale	Hawaii	0	4	4	11,278	0.04 [b]
	Mexico-North Pacific				UNK[c]	UNK[c]
Total	—	**14**	**348**	**362**	—	—

[a] Population estimates used in calculations are presented in Chapter 4.
[b] These percentages assume that all potential exposures come from each stock; therefore, each percentage should be adjusted down if multiple stocks are actually affected.
[C] Abundance estimates for the Mexico-North Pacific stock of humpback whales are considered unknown. The most recent minimum population estimates (N_{MIN}) for this population include an estimate of 2,241 individuals between 2003 and 2006 (Martinez-Aguilar 2011) and 766 individuals between 2004-2006 (Wade 2021). Assuming the population has been stable, the 4 takes of this stock proposed for authorization represents small numbers of this stock (0.18%of the stock assuming a N_{MIN} of 2,241 individuals and 0.52% of the stock assuming an N_{MIN} of 766 individuals).
Note: NA = not applicable; DPS = distinct population segment, UNK = unknown

4.6.2.4 Vessel Strike Impacts to Marine Mammals

Project-related construction would require the use of a tugboat, barges, and a small skiff, which would likely temporarily increase the occurrence of such vessels in the Project area compared to baseline conditions. All temporary pile installation and removal as well as in-water sheet pile removal would take place from a floating work barge and crane. A primarily marine-based operation is required because of the instability of the soil behind the sheet pile walls.

The potential for striking marine mammals with vessels during the proposed pile driving is low. Studies of whale strikes have established that vessel speed is correlated with risk of striking a whale and with the resulting level of injury (Laist et al. 2001; Vanderlaan and Taggart 2007; Neilson et al. 2012). In Alaska, an analysis of the characteristics of whale strike incidents found that 44 percent of the vessels were traveling at speeds of 12 knots or greater, and 14 percent were traveling at speeds less than 12 knots prior to collision (for 17 percent, the vessel's activities prior to the collision were unknown; Neilson et al. 2012). In addition to vessel speed, factors that increase a vessel's risk of striking a whale include drifting with the engine off, sailing with the motor off, and following or watching whales (Neilson et al. 2012). The influence of vessel speed in contributing to either a lethal or a non-lethal injury was examined for records of ship strikes worldwide (Laist et al. 2001; Vanderlaan and Taggart 2007). Among collisions between motorized vessels and whales that caused lethal or severe injuries, 89 percent involved vessels moving at 14 knots or faster, and 11 percent involved vessels moving at 10 to 14 knots; no lethal or severe injuries were documented at speeds below 10 knots (Laist et al. 2001). Tugs, regardless of whether they are pulling barges, do not generally approach vessel speeds that have been reported to result in vessel strikes. Analysis of the influence of vessel type on whale strikes has not documented any instances of a tug striking a free-swimming whale in the wild (see Laist et al. 2001; Neilson et al. 2012).

Project-related vessels would not be engaging in activities that heighten the risk of striking whales (e.g., drifting with the engine off, sailing with the motor off, and following or watching whales). Project-related vessels would move at slow speeds, or remain anchored or moored as they engage in support for pile installation and removal. Tugs, barges, and other Project-related vessels would therefore be at low risk of striking a whale or other marine mammal, and the potential for this adverse impact is discountable. Furthermore, required mitigation measures would ensure that direct physical interaction with marine mammals during dredging activities would be avoided.

4.7 Impacts on Subsistence

Residents of the Native Village of Tyonek are the primary subsistence users in the upper Cook Inlet area. In 1999, a moratorium was enacted (Public Law 106-31) prohibiting the subsistence harvest of Cook Inlet beluga whales except through a cooperative agreement between NMFS and the affected Alaska Native organizations. NMFS began working cooperatively with the Cook Inlet Marine Mammal Council, a group of tribes that traditionally hunted Cook Inlet beluga whales, to establish sustainable harvests. There has been no subsistence harvest of beluga whales since 2005 (NMFS 2016b). Harvests of harbor seals for traditional and subsistence uses by Alaska Natives have been low in upper Cook Inlet, although these data are not currently being collected and summarized. No harassment of marine mammals would occur in or near Tyonek's identified traditional subsistence hunting areas as it would generally be limited to within approximately 2 to 3 km (1.1 to 1.9 mi) of the POA within Knik Arm and only very temporarily beyond that. Additionally, as the harvest of marine mammals in upper Cook Inlet is historically a small portion of the total subsistence harvest, and the number of marine mammals using upper Cook Inlet is proportionately small, the number of marine mammals harvested in upper Cook Inlet is expected to remain low. Although the proposed NES1 Project would likely result in temporary disturbances to small numbers of harbor seals and Steller sea lions (a species not traditionally hunted in upper Cook Inlet) during pile installation, any impacts are expected to be minor modifications to behavior (e.g., avoidance of the immediate vicinity of the POA) or slight TTS for a limited number of individuals. NMFS does not anticipate that the Project would adversely impact the availability of marine mammal species for subsistence uses.

The NES1 Project construction activities would not occur near a traditional subsistence hunting area and are not anticipated to affect the availability of marine mammals for subsistence uses. Even so, the POA communicated with representative Alaska Native subsistence users about the NES1 Project construction activities. The POA would send letters to 15 tribal entities, including the communities of Kenaitze, Tyonek, Knik, Eklutna, Ninilchik, Salamatof, and Chickaloon, informing them of the NES1 Project and NMFS' notice of proposed IHA, and identifying potential impacts on marine mammals as well as planned mitigation efforts. Tribes had an opportunity to comment on the proposed IHA and to communicate with the POA. No tribes expressed concern over subsistence use during the public comment period for the proposed IHA.

NMFS does not anticipate that the authorized taking of affected species or stocks would reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by (1) causing the marine mammals to abandon or avoid hunting areas, (2) directly displacing subsistence users, or (3) placing physical barriers between marine mammals and subsistence hunters that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met. Therefore, the direct or indirect, long-term, adverse impacts on subsistence beyond the Project site are expected to be negligible.

4.8 Cumulative Effects

In reviewing the information provided in the NES1 IHA application about the action area, NMFS determined that activities with the potential to permanently remove a resource would be expected to have additive or synergistic impacts if they affect the same population, even if the effects were separated

geographically or temporally. Therefore, this cumulative effects analysis considers these potential impacts; however, it focuses on activities that may temporally or geographically overlap with the POA's proposal to construct NES1 such that the effects of harassment warrant consideration for potential cumulative impacts to the following potentially affected marine mammal species: beluga whale, humpback whale, harbor porpoise, killer whale, gray whale, Steller sea lion, and harbor seal.

Incidental take of seven species of marine mammals is the primary environmental effect associated with the consideration of whether to issue the IHA to the POA. Individuals found in the action area may be adversely affected by activities anywhere within their habitat range, as a number of natural and human activities occur in Cook Inlet. These generally include subsistence hunting; pollution; fisheries interaction; vessel traffic; coastal zone development, both at the POA and elsewhere; oil and gas development; mining; marine mammal research; and climate change.

The following sections briefly summarize the natural and human-related activities affecting the marine mammal species in the action area.

4.8.1 Subsistence Hunting

The practice of hunting marine mammals for food, clothing, shelter, heating, and other uses is an integral part of the cultural identity of Alaska Native peoples and communities. In Cook Inlet, Alaska Natives historically hunted beluga whales and continue to hunt harbor seals. However, NMFS determined that subsistence harvest activities by Alaska Natives would not contribute to significant cumulative impacts when considered with other past, current, or reasonably foreseeable future actions. As explained in Section 3.3.1, not all of the potentially affected marine mammal species in Cook Inlet are used for subsistence purposes and, of these, the only marine mammal species currently with subsistence value in Cook Inlet is the harbor seal. Alaska Natives have not hunted Cook Inlet beluga whales since 2005, and issuance of an IHA would not adversely affect annual rates of recruitment or survival of the Cook Inlet beluga whale stock (i.e., the Proposed Action would not contribute to the population decline). Furthermore, based on harvest limitations established for harbor seals, known annual harvest rates (as monitored by ANHSC and ADF&G), combined with the fact that no subsistence takes of harbor seals are known to occur in the vicinity of the proposed NES1 Project, NMFS has reasonably concluded that take associated with subsistence harvest would have no significant cumulative impacts on the harbor seal population.

4.8.2 Pollution

The amount of pollutants that enter this portion of Knik Arm is likely to increase as populations in urban areas continue to grow. Sources of pollutants in urban areas include runoff from streets and discharge from wastewater treatment facilities. Gas, oil, and coastal zone development projects (see Sections 4.8.5 and 4.8.6) also contribute to pollutants that enter Knik Arm through discharge. These sources of pollutants are expected to continue in Knik Arm; therefore, it would be anticipated that pollutants could increase in this portion of Knik Arm. However, the U.S. Environmental Protection Agency and the Alaska Department of Environmental Conservation will continue to regulate the amount of pollutants that enter Knik Arm from point and non-point sources through Alaska Pollutant Discharge Elimination System permits. As a result, permit holders will be required to renew their permits, verify that they meet permit standards, and upgrade facilities if necessary. Additionally, the extreme tides and strong currents in Knik Arm and Cook Inlet may contribute to a reduction in the amount of pollutants found there.

4.8.3 Fisheries Interaction

Fishing is a major industry in Alaska. Cook Inlet supports several commercial fisheries (e.g, chum, sockeye, coho, Chinnok, and pink salmon) and recreational fisheries (e.g., Chinook and coco salmon, Pacific cod, and halibut). The average annual commercial harvest of salmon in upper Cook Inlet from

1966-2016 was 3.5 million (Shields and Dupuis 2017). The most recent 10-year average annual commercial salmon fishery harvest is 2.5 million fish, and the 2022 harvest of 1.4 million was 44 percent less than the 10-year average. The 2022 upper Cook Inlet commercial harvest compared to the recent 10-year average was down 34% for chum, 43% for sockeye, 44% for coho, 58% for Chinook, and 72% for pink salmon. At this point, it is hard to know if these results are a short-term reflection of natural variation or are an indicator of a more systematic shift and downward trend. Salmon are the primary prey item for Cook Inlet beluga whale and these numbers may be a cause for concern; at best, they indicate there are fewer salmon available for commercial fisheries, recreational, personal and subsistence use, and beluga whales.

Amendment 14 to the Fishery Management Plan for the Salmon Fisheries in the Exclusive Economic Zone off Alaska closed federal waters of Cook Inlet to commercial salmon fishing in November 2021. However, in June 2022, the district court overturned the closure of federal waters to commercial driftnet fishing. In the absence of any federal regulations, the State of Alaska manages commercial salmon fishing in both the State and federal waters of Cook Inlet.

As long as fish stocks are sustainable, subsistence, personal use, recreational, and commercial fishing would continue in Cook Inlet. As a result, continued prey competition, risk of ship strikes, potential harassment, potential for entanglement in fishing gear, and potential displacement from important foraging habitat would occur for beluga whales and other marine mammals. An important remaining unknown is the extent to which Cook Inlet marine mammal prey is made less available due to commercial, subsistence, personal use, and sport fishing either by direct removal of the prey or by human-caused habitat avoidance. NMFS assumes that ADFG will continue to manage fish stocks and monitor and regulate fishing in Cook Inlet to maintain sustainable stocks. An important remaining unknown is the extent to which Cook Inlet marine mammal prey is made less available due to commercial, subsistence, personal use, and sport fishing either by direct removal of the prey or by human-caused habitat avoidance.

4.8.4 Vessel Traffic

Major contributors to vessel traffic throughout Cook Inlet include port facilities, oil and gas development, and commercial and recreational fishing.

The POA yields a high volume of vessel traffic that passes through or near the action area. The POA handles half of all Alaska inbound fuel and freight (shipped via marine, road, and air), half of which is delivered to final destinations statewide, outside the Municipality of Anchorage. It serves approximately 90 percent of Alaska's population (POA 2019a), providing access to fuel and non-fuel cargo items such as food, consumer goods, building materials, cars, cement, and other goods critical for Alaskans' everyday requirements. Seventy five percent of all non-petroleum marine cargo shipped into Alaska (not including Southeast Alaska, which is served from barges directly from Puget Sound) moves through the POA (POA 2019a).

Major vessels calling to the POA include cargo ships, barges, tankers, dredgers, military ships, and tugboats (POA 2009). According to data from 1998 to 2011, an average of approximately 450 vessels call to the POA annually (POA 2014). The POA is proposing to modernize its facilities (see Section 4.8.5.2); however, these facility updates are not expected to increase vessel traffic. An increase in vessel traffic could occur, however, from continuing city and state development and growth.

Port MacKenzie is also located in Knik Arm and contributes to vessel traffic that passes through or near the action area. It receives approximately two large ships (a landing craft and/or a barge) annually, which is substantially fewer than the POA. The Port MacKenzie Rail Extension Project, when completed, will connect Port MacKenzie to the Alaska Railroad Corporation's existing mainline between Wasilla and Willow, and will provide freight service between Port MacKenzie and Interior Alaska. Currently, no funding is allocated for completion of the rail extension, and no work has been conducted since 2015.

Additionally, Port MacKenzie has long-term plans to expand their deep-draft dock; however, no funding is currently allocated for design or construction. If it is expanded, the number of ships calling at Port MacKenzie is anticipated to increase. Increased vessel traffic could result in increased in-water noise and potential ship strikes to marine mammals.

Beyond Knik Arm and, to a lesser extent, other, smaller port facilities may contribute to vessel traffic in Cook Inlet. These include Nikiski, the City of Kenai, Kasilof, Ninilchik, Williamsport, and Tyonek. Vessels ranging from tankers to fishing boats call to these ports (Kenai Peninsula Borough 2003). Gas and oil development, as well as commercial and recreational fishing vessels, also contribute to vessel traffic in the area.

4.8.5 Coastal Zone Development

Coastal zone development in this area of Knik Arm may result in the loss of habitat, increased vessel traffic, increased pollutants, and increased noise associated with project construction and operation. Potential projects within the area include mining projects, renewable energy projects (Fire Island Wind Project Phase 2 and tidal energy development), and coastal construction (e.g., port expansions and maintenance, roadway construction; see Figure 13). These activities are discussed below.

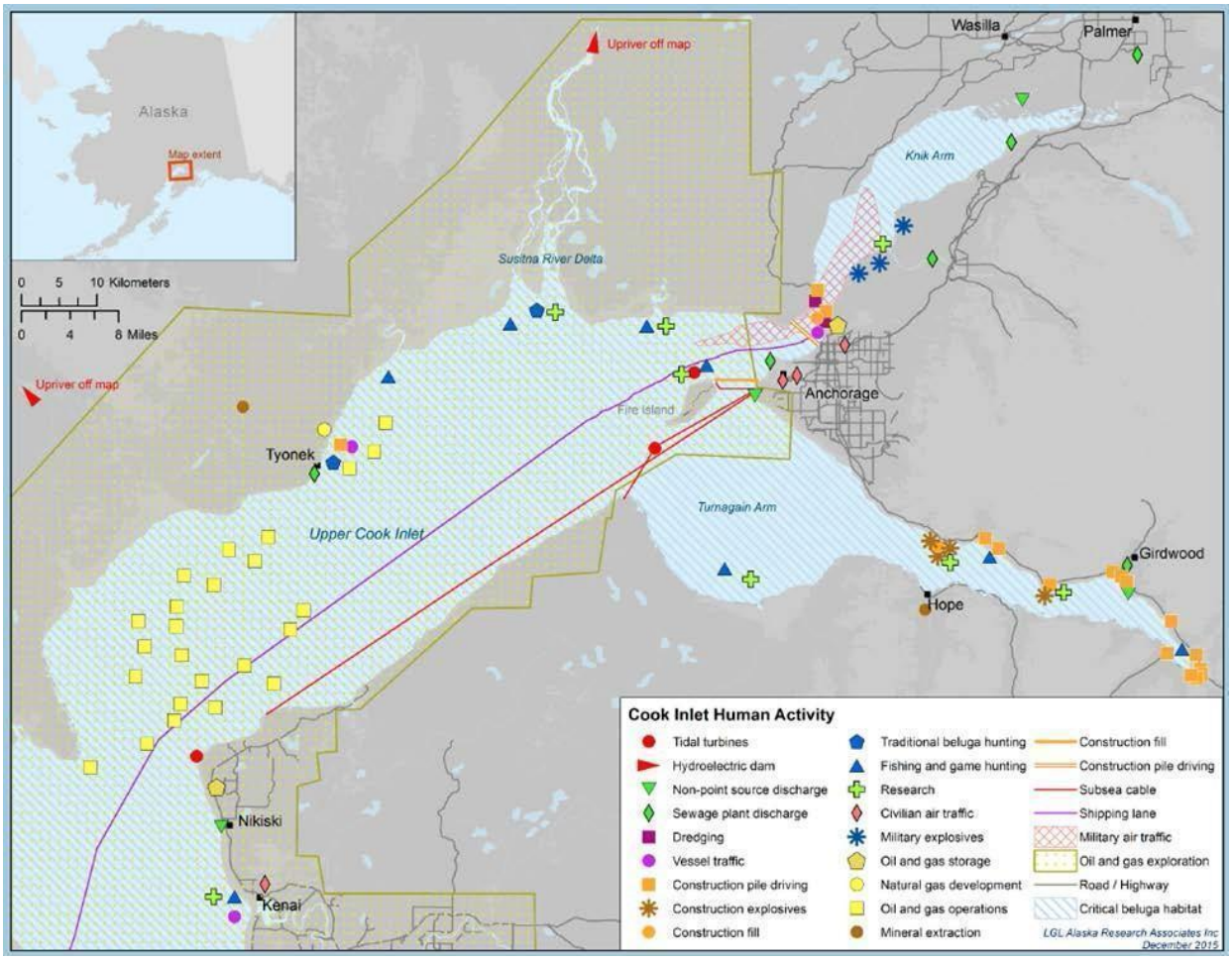


Figure 13. Example Development Activities in Cook Inlet
Source: LGL unpublished data 2015

4.8.5.1 Road Construction

The Alaska Department of Transportation and Public Facilities (DOT&PF) Seward Highway Milepost 75 to 90 (along Turnagain Arm) Project included geophysical and geotechnical (G&G) testing, onshore blasting, pile removal and installation at stream crossings, and fill placed into Turnagain Arm to facilitate roadway straightening. The project also included resurfacing 15 mi of roadway, straightening curves, installing new passing lanes and parking areas, and replacing eight existing bridges. Replacement of these bridges included vibratory and impact pile installation and removal of both 24- and 48-inch steel pipe piles. In-water work on this project was avoided from 15 May to 15 June to avoid harassment of Cook Inlet beluga whales during the eulachon run, and work that was conducted in-water below mean high water required marine mammal monitoring by PSOs. This project is expected to be substantially completed in 2023.

DOT&PF's Seward Highway Milepost 98.5 to 118 (Bird Flats to Rabbit Creek) Project proposes safety and capacity improvements to the alignment and road cross section. The upgrades would likely require widening the highway corridor either into the mountainside or toward the marine waters and may include relocating railroad track sections. Activities may include G&G testing, onshore blasting, pile installation and removal at stream crossings for new bridges, and fill placed into Turnagain Arm. The project is still in the early planning phases and no construction schedule is available.

4.8.5.2 Port of Alaska (POA)

The POA plans to continue to modernize POA facilities as part of the PAMP. In 2019, the POA completed construction of the South Backlands Stabilization Project, and construction of the PCT and SFD was completed in 2022. The next phase of the PAMP includes construction and demolition associated with the NES1 project and replacement of General Cargo Terminal 1 and Terminal 2. Other phases of the PAMP include replacing petroleum oil lubricants (POL) terminal 2 (POL 2), NES Step 2, and demolition of Terminal 3. It should be noted that the NES Step 1 and 2 Projects will remove existing filled areas and convert them to open marine waters, resulting in beneficial impacts on the marine environment, fish, and marine mammals.

The POA is Alaska's largest seaport and provides 90 percent of the consumer goods for about 85 percent of all of Alaska. It currently includes three cargo terminals, two petroleum terminals, one dry barge berth, two railway spurs, a small craft floating dock, and 220 acres of land facility. It is located in the Municipality of Anchorage, and approximately 450 ships call at the POA each year.

Operations began at the POA in 1961 with a single berth. Since then, the POA has expanded to a terminal with five berths that moves more than 4 million tons of material across its docks each year (McDowell 2020). The POA plans to continue to modernize its facilities as part of the PAMP, which includes multiple construction projects (Figure 14) to enable continued port operations, update facilities for operational efficiency, accommodate modern shipping operations, and improve seismic resiliency.[18] NES1, as part of the PAMP, will include the conversion of approximately 13 acres of developed land back to intertidal and subtidal habitat within Knik Arm. Future phases of the PAMP will depend upon funding that is not yet secured. The PAMP website[15] describes the funding requests to the State of Alaska and alternative sources of funding such as taxes or cargo tariffs. Additional information is provided below.

[18] https://modernization.portofalaska.com/

Figure 14. Phases 1 through 5 of the Port of Alaska Modernization Program

The POA is currently working on the NES1 Project as well as design and permitting for replacement of Terminals 1 and 2 as part of Phase 2 of the PAMP, the Cargo Terminals Replacement Project (CTR Project). Terminals 1 and 2 are the existing container and general cargo terminals and are the only deep-water marine cargo terminals in Anchorage. The POA cargo services supply goods for 87 percent of Alaska's population. Replacement of Terminals 1 and 2 is currently estimated to begin in 2025.

The CTR Project includes demolition of the two existing marine terminals and construction of two new marine terminals, 140 ft farther seaward than the existing terminals. Each terminal would include a pile-supported platform, pile-supported access trestles, a mooring system, and a fender system. Terminal 1 would support a lift-on/lift-off ship-to-shore rail mounted gantry crane system for the transfer of cargo. Terminal 2 would support a roll-on/roll-off and lift-on/lift-off cargo transfer system. Terminal 2 would also include a single mooring dolphin. Excavation and placement of fill and armor rock would take place adjacent to Terminals 1 and 2 to protect the shoreline. Takes proposed to be authorized for the CTR project would not result in aggregate, cumulative effects, because all takes would be limited to temporary Level B harassment.

Other future phases of the PAMP include replacing POL Terminal 2 as Part of Phase 3, and further stabilization of NES2 and demolition of Terminal 3 as part of Phases 4 and 5. It should be noted that the NES1 and NES2 Projects will remove existing filled areas and convert them to open marine waters, resulting in beneficial impacts on the marine environment. The construction schedules for Phases 3 through 5 are currently uncertain.

The USACE has been conducting maintenance dredging annually at the POA since 1965 and continues to do so throughout each year. The POA is dredged to the depth of minus 35 ft MLLW. Dredged materials are dumped 3,000 ft abeam of the POA dock face at the Anchorage Harbor Open Water Disposal Site. NMFS issued a LOC under the ESA for their current USACE permit in 2017. In 2023, the USACE issued a FONSI for the POA to conduct transitional dredging at the terminal facility and dredged material disposal offshore. These activities will provide the needed depths for berthing vessels at the new terminal facility (mentioned above). Once the POA's dredging is complete, the USACE will maintain dredging at this location.

Dredging operations also occur annually at the Ship Creek Boat Ramp, located approximately 2.3 km (1.5 mi) southwest of the POA NES1 Project location. The POA dredging at this site is accomplished in early May during minus 3-ft tides and is usually accomplished in 3 to 4 days using heavy machinery. Dredging at the POA does not seem to be a source of re-suspended contaminants (USACE 2023), and beluga whales often pass near the dredge (USACE 2008, 2023; ICRC 2012).

4.8.5.3 Port MacKenzie

As discussed in Section 4.8.4, Port MacKenzie also has the potential to expand its facilities, depending on future needs associated with large resource development projects. An increase in vessel traffic may have an effect on marine mammals. Construction activities, as well as the placement of piers and abutments, may have an effect on marine mammals, their habitat, and their prey species. However, NMFS is not currently aware of any specific planned and funded projects at Port MacKenzie.

4.8.5.4 Tidal Energy

A tidal energy project is in the preliminary stages of determining if a saltwater generator can be used to power the machine that provides cathodic protection to the Port MacKenzie dock. The saltwater generator could potentially generate 80 kilowatts of power (Poux 2022).

An application for a preliminary permit from the Federal Energy Regulatory Commission has been submitted for a proposed Turnagain Arm tidal electric generation water power project. The project is in the early planning stages and details such as equipment and placement are not currently available.

4.8.5.5 Joint Base Elmendorf Richardson (JBER)

The Department of the Air Force is preparing an environmental impact statement (EIS) to assess the potential social, economic, and environmental impacts associated with modifying the conditions under which indirect live-fire weapons training can be conducted at JBER. The EIS would evaluate the potential impacts associated with indirect live-fire training during all seasons at the Eagle River Flats Impact Area as well as potential impacts associated with the proposed expansion of the Eagle River Flats by approximately 585 acres on JBER (DAF 2022). A Draft EIS is anticipated to be available in late 2023, with a Final EIS available in mid-2024 followed by a Record of Decision in early 2025 (DAF 2022).

JBER recently received approval from the USACE for the establishment of a restricted area within Knik Arm to prevent vessels and individuals from entering the explosive arc area of the Six Mile Munitions Storage Area (88 FR 18051). Except for authorized vessels and individuals in support of military training and management activities the restriction is always in effect. The restricted area is located north of the Port.

4.8.6 Oil and Gas Development

The Alaska Department of Natural Resources' Division of Oil and Gas has issued a preliminary best interest finding for proposed Cook Inlet area-wide oil and gas lease sales, 2019 through 2028. The lease sales could lead to increased oil and gas development in Cook Inlet; however, it is uncertain if oil and gas companies will be interested in acquiring these leases given the commodity prices, the state's tax structure, and the sustainable investment required to explore and develop offshore leases. Currently, 18 existing oil and gas drilling platforms are in Cook Inlet, 11 of which are active.

Currently, 14 active Outer Continental Shelf Oil and Gas Leases occur in the Cook Inlet region (BOEM 2022). The Bureau of Ocean Energy Management held Lease Sale 258 for Cook Inlet in 2022 that offered 193 blocks toward the northern part of the Cook Inlet Planning Area for leasing. These blocks stretch roughly from Kalgin Island in the north to Augustine Island in the south (BOEM 2022). The sale generated one bid for one tract.

Impacts from gas and oil development include temporary increased noise from seismic activity, vessel and air traffic, and well drilling; discharge of wastewater; small areas of habitat loss from the construction of oil and gas facilities; and contaminated food sources and/or injury from a natural gas blowout or oil spill. For projects where an IHA is requested, marine mammal exposure to seismic activities is mitigated to effect the least practicable adverse impact. It is a common requirement for seismic operations to maintain extensive marine mammal monitoring (e.g., flights) and shutdown if Cook Inlet beluga whales are observed. The risk of these impacts may increase as oil and gas development increases; however, new development will undergo consultation and permitting requirements prior to exploration and development. If authorizations are issued to these applicants, they will be required to implement mitigation and monitoring measures to reduce impacts to marine mammals and their habitat in the area, and will be subject to the same MMPA and, when applicable, ESA standards.

NMFS has received applications requesting takes of marine mammals incidental to seismic surveys and drilling operations in this area. NMFS issued a LOA to the Alaska Gasline Development Corporation for take of marine mammals, by harassment, incidental to construction of a marine terminal near Nikiski and installation of a pipeline in Cook Inlet. NMFS issued the LOA on 21 September 2020, and it will be valid from 01 January 2021 through 31 December 2025 (85 FR 59291); however, to our knowledge, construction has not started. Mitigation and monitoring measures include ramp-ups, shutdown zones, and PSO monitoring for the project, known as the Alaska Liquefied Natural Gas Project. Seismic surveys in Cook Inlet (such as Hilcorp's G&G surveys for which NMFS issued an LOA [84 FR 37442, 31 July 2019] and is currently reviewing an application for an IHA) that contain required mitigation, monitoring, and reporting measures will continue as the industry seeks a better understanding of available oil and gas deposits. The key mitigation and monitoring measures contained within Hilcorp's rule and LOA for

seismic activity (84 FR 37442, 31 July 2019), which are designed to reduce the intensity of any harassment that may occur incidental to the surveys, include the following:

- Establishment of an exclusion zone (i.e., area in which all operations are shut down in the event a marine mammal enters or is about to enter this zone) within 10 nmi of the Susitna River Delta during periods of biological significance for beluga whales.
- Establishment of an exclusion zone for the mouth of the Kasilof River.
- Implementation of shutdown whenever beluga whales are observed during use of airguns, regardless of distance.
- Implementation of airgun shutdown procedures during the activity when marine mammals are detected within or about to enter the exclusion zone, to reduce the SEL to below that which could cause injury to marine mammals.
- Implementation of airgun ramp-up procedures when the array is started, to provide marine mammals with a warning and allow marine mammals to vacate the area.
- Use of aerial surveys before starting seismic airgun surveys each day to look for groups of beluga whales that could be within the Level B harassment zone of the day's planned survey area.
- Use of NMFS-approved PSOs on the source vessel and mitigation vessel.

The LOAs and IHAs proposed (or request to propose) for these projects limit take by Level B harassment to no more than 20 beluga whales per year. Any harassment from these oil and gas projects would not occur within Knik Arm and would be concentrated toward middle and lower Cook Inlet. Therefore, the separation of time and space as well as limited take authorized is not likely to result in significantly cumulative effects on beluga whales or other marine mammal species. Further, given the distance between the POA and the oil and gas projects and differences in the timings of activities, it is unlikely that a beluga whale or other marine mammal species would be exposed to sound levels associated with construction at the NES1 and oil and gas projects in a single day.

4.8.7 Mining

The Pebble Limited Partnership proposes to develop the Pebble copper-gold-molybdenum porphyry deposit (Pebble Deposit) as a surface mine in Southwest Alaska near Iliamna Lake, approximately 200 mi (321.9 km) southwest of Anchorage and 60 mi (96.6 km) west of Cook Inlet. The project would include development of the open pit mine, with associated infrastructure to include a 270-megawatt power generating plant. A 166-mi (267.2 km) natural gas pipeline from the Kenai Peninsula across Cook Inlet to the mine site is proposed as the energy source for the mine. The USACE identified the Northern Route as the preferred transportation corridor for the mine in the final Environmental Impact Statement for the project, published in July 2020 (USACE 2020a). The transportation corridor includes mine and port access roads, including an 82-mi (132.0 km) gravel access road along the northern edge of Iliamna Lake, and an Amakdedori port facility at Diamond Point in Iliamna Bay, approximately 165 mi (265.5 km) southwest of Anchorage. The construction and operation of the port facility could also impact marine mammals within Cook Inlet; however, the construction method and plans are currently unknown. If impacts, such as behavioral harassment or hearing threshold shifts, would occur for marine mammals from construction of the Pebble Limited Partnership port, any impacts would not occur during the NES1 Project and would be farther removed in space (i.e., lower in the inlet). On 25 November 2020, the USACE issued a Record of Decision that denied The Pebble Limited Partnership a permit to construct the mine (USACE 2020b). The Pebble Limited Partnership filed an appeal of the USACE's decision in January 2021 (Pebble Limited Partnership 2021). The U.S. Environmental Protection Agency blocked the project under the Clean Water Act in January 2023, and the future of the project is unknown.

4.8.8 Marine Mammal Research

Many important aspects of marine mammal biology remain unknown or are incompletely studied. Additionally, management of these species and stocks requires knowledge of their distribution, abundance, migration, population, ecology, physiology, genetics, behavior, and health. Therefore, free-ranging marine mammal species are frequently the subjects of scientific research and studies.

Research activities typically include close approach by vessel and aircraft for line-transect surveys; behavioral observation; photo-identification and photo-video-grammetry; passive acoustic recording; attachment of scientific instruments (tagging) by both implantable and suction cup tags; biopsy sampling, including skin and blubber biopsy and swabbing; land-based surveys; and live capture for health assessments, blood and tissue sampling, pinniped tooth extraction, and related pinniped anesthesia procedures. All researchers are required to obtain scientific research permits from NMFS OPR under the MMPA and/or ESA (if an ESA-listed species is involved). Permits authorizing research in Cook Inlet on beluga whales, harbor seals, harbor porpoises, Steller sea lions, humpback whales, and killer whales may have cumulative effects on these species and stocks, but they are expected to be negligible to minor based on the specific research methodology. NMFS anticipates that scientific research on marine mammals in Cook Inlet will continue, and possibly expand, due to the increasing need to better understand distribution and abundance relative to temporal (e.g., seasonal, diel, or tidal) and spatial (e.g., geographic, bathymetric) parameters. However, the acoustic research currently conducted on beluga whales is passive in nature (hydrophone-based) and has no impact on marine mammals.

Currently, there are two active research permits that include studies on Cook Inlet beluga whales. One study, led by the Cook Inlet Beluga Whale Photo-ID Project, is using photo-identification methods to identify individual whales and to provide information about movement patterns, habitat use, survivorship, reproduction, and Cook Inlet beluga whale population size. The other study, led by the Marine Mammal Laboratory at the NOAA Fisheries Alaska Fisheries Science Center , is designed to monitor cetacean population trends, abundance, distribution, and health in the North Pacific Ocean, Bering, Beaufort, and Chukchi Seas, and Gulf of Alaska (including adjoining bays and inlets) through the following techniques: crewed and uncrewed aerial surveys for counts, observations, photo-id, photogrammetry, and video of cetaceans; vessel surveys for counts, collection (prey remains, sloughed skin, and eDNA), observation, photo-id, video, sampling (exhaled air, feces, skin and blubber), instrumenting (invasive [dart/barb, dorsal fin/ridge, deep-implant] and non-invasive [suction cup] tags), and acoustic playbacks.

4.8.9 Climate Change

Climate change is a reasonably foreseeable condition that may result in cumulative effects to marine mammals in Cook Inlet (BOEM 2016). The 2023 Intergovernmental Panel on Climate Change synthesis report concluded that “human activities, principally through emissions of greenhouse gases have unequivocally caused global warming” (IPCC 2023). A recent special report indicates that human activities are estimated to have caused approximately 1.1 degree Celsius (°C) of global warming above pre-industrial levels, with a likely range of 0.95°C to 1.2°C with larger temperature increases over land than over the ocean. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate (IPCC 2023). This study involved numerous models to predict changes in temperature, sea level, ice pack dynamics, and other parameters under a variety of future conditions, including different scenarios for how human populations respond to the implications of the study.

Evidence of climate change in the past few decades has accumulated from a variety of geophysical, biological, oceanographic, and atmospheric sources. The scientific evidence indicates that average air, land, and sea temperatures are increasing at an accelerating rate. Although climate changes have been documented over large areas of the world, the changes are not uniform, and they affect different areas in different ways and at differing intensities. Arctic regions have experienced some of the greatest changes, with major implications for the marine environment as well as for coastal communities.

Marine mammals are classified as sentinel species because they are good indicators of environmental change. Arctic marine mammals are ideal indicator species for climate change, due to their circumpolar distribution and close association with ice formation. NMFS recognizes that warming of the Arctic, which results in diminishing ice thickness and spatial extent, could be a cause for concern for marine mammals. In Cook Inlet, marine mammal distribution is dependent upon ice formation and prey availability, among other factors. For example, beluga whales often travel just along the ice pack and feed on prey beneath it (Richardson et al. 1990, 1991). Any loss of ice and environmental conditions such as rising water temperature could result in prey distribution changes or loss for beluga whales or other marine mammals. Ice, however, is not directly used in Cook Inlet for resting, reproduction, or rearing of young, as is the case for ice-dependent pinnipeds.

Models predict that the climate changes observed in the past 30 years will continue at the same or increasing rates for at least 20 years. Although NMFS recognizes that concern for climate change in the Project area is warranted, the full extent to which climate change would affect marine mammals in Knik Arm is unclear. The NES1 Project is planned to occur during a 1-year period, during which time the impacts of climate change on marine mammals are likely to remain at baseline levels.

4.8.10 Conclusion

Based on the summation of past, present, and reasonably foreseeable future actions provided in this section, we believe that the incremental impacts to marine mammals and their habitat from issuance of the IHA to the POA for the NES1 Project would not result in cumulatively significant impacts to the human environment when added to other past, present, or reasonably foreseeable future activities. Other relevant actions to be considered in evaluating potentially cumulatively significant impacts include subsistence hunting, pollution, commercial and recreational fishing, vessel traffic, coastal construction at the POA and elsewhere, oil and gas development activities, mining, marine mammal scientific research, climate change, and other sources of anthropogenic trauma. While consideration of these activities in sum suggests an increase in industrialization of Cook Inlet, many of these activities are spatially and temporally limited and do not permanently reduce or degrade the habitat available to marine mammals or their prey species. Cook Inlet is also a geographically vast area, and many activities, including the activities proposed by the POA, are geographically distinct to various portions of the inlet, which prevents the continued or permanent disruption of one particular portion of the inlet for extended durations.

The NES1 Project would add an incremental contribution to the combined environmental impacts of other past, present, and reasonably foreseeable future actions; however, those direct and indirect adverse impacts are expected to be mainly short-term, localized, and minor, as described in this EA. None of the harassment authorized by NMFS in other ITAs would overlap in time or space with impacts from the NES1 Project. Where impacts from construction of the NES1 are permanent, any PTS would likely be a slight threshold shift (e.g., a sound might have to be minimally louder to be perceived) and would be limited to low-frequency ranges (as described in this EA). Therefore, overall, the potential for PTS is minor and, if it occurs, it would be only slight PTS. Further, the amount of Level A harassment authorized in the form of PTS is for a small number of animals with respect to large population sizes. Therefore, any cumulative impacts would affect so few individuals that the impact on the population would not likely be realized. In summary, incremental impacts of NMFS' Proposed Action, in combination with other actions, would be negligible on the populations of species analyzed.

Chapter 5 List of Preparers and Agencies Consulted

Agencies Consulted

NOAA/National Marine Fisheries Service, Office of Protected Resources

NOAA/National Marine Fisheries Service, Alaska Region

Prepared By

Reny Tyson Moore, MMPA Incidental Take Program

NOAA/National Marine Fisheries Service, Office of Protected Resources

Chapter 6 Literature Cited

61 North (61N) Environmental. 2021.

2020 Petroleum and Cement Terminal Construction Marine Mammal Monitoring Final Report. Prepared for Pacific Pile and Marine, Port of Alaska, and NMFS by 61N Environmental. February 2021.

2022a 2021 Petroleum and Cement Terminal Construction Marine Mammal Monitoring Final Report. Prepared for Pacific Pile and Marine, Port of Alaska, and NMFS by 61N Environmental. February 2022.

2022b 2022 Port of Alaska South Float Dock Construction Marine Mammal Monitoring. Prepared for Pacific Pile and Marine, Port of Alaska, and NMFS by 61N Environmental. October 2022.

2022c 2022 Port of Alaska PCT/SFD Dredging Marine Mammal Monitoring Final Report. Prepared for Pacific Pile and Marine, Port of Alaska, and NMFS by 61N Environmental. October 2022.

ABR, Inc.

2017 *Protected Species Monitoring Report – 2017 Ship Creek Boat Launch Repairs Project, Anchorage AK*. Prepared for R&M Consultants, Inc., and Municipality of Anchorage, Port of Anchorage.

Aerts, L.A.M., and W.J. Richardson (eds.)

2008 *Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2007: Annual Summary Report*. LGL Rep. 1005b. Prepared by LGL Alaska Research Associates, Inc. (Anchorage, AK), Greenridge Sciences Inc. (Santa Barbara, CA), and Applied Sociocultural Research (Anchorage, AK) for BP Exploration (Alaska) Inc., Anchorage AK.

ADF&G (Alaska Department of Fish & Game)

2010 Variation and predictors of vessel-response behavior in a tropical dolphin community. NOAA technical memorandum NMFS. NOAA-TMNMFS-SWFSC-457. Available online at https://repository.library.noaa.gov/view/noaa/3747.

2021 *Petroleum and Cement Terminal Construction Marine Mammal Monitoring Final Report*. Prepared for Pacific Pile and Marine, Port of Alaska, and NMFS. February 2022.

2022 Gray Whale (*Eschrichtius robustus*) Species Profile. Available online at https://www.adfg.alaska.gov/index.cfm?adfg=graywhale.main.

Allen, B.M., and R.P. Angliss

2010 *Alaska Marine Mammal Stock Assessments, 2009*. NOAA Technical Memorandum NMFS-AFSC-233. National Marine Fisheries Service, Seattle, WA.

2011 *Alaska Marine Mammal Stock Assessments, 2010*. NOAA Technical Memorandum NMFS-AFSC-234. National Marine Fisheries Service, Seattle, WA.

Archer, F.I., S.L. Mesnick, A.C. Allen

2010 *Variation and predictors of vessel-response behavior in a tropical dolphin community. NOAA technical memorandum* NMFS. NOAA-TMNMFS-SWFSC-457. Available online at https://repository.library.noaa.gov/view/noaa/3747.

Atwood T.C., E. Peacock, M.A. McKinney, K. Lillie, R. Wilson, D.C. Douglas, S. Miller, and P. Terletzky.

2016. Rapid Environmental Change Drives Increased Land Use by an Arctic Marine Predator. PLoS ONE 11(6): e0155932. Available online at https://doi.org/10.1371/journal.pone.0155932.

Au, W.W.L., and P.W.B. Moore

1988 Detection of complex echoes in noise by an echolocating dolphin. *Journal of the Acoustical Society of America* 83:662-668.

1990 Critical ration and critical bandwidth for the Atlantic bottlenose dolphin. *Journal of the Acoustical Society of Americ*a 88:1635-1638.

Au, W.W.L., and M.C. Hastings

2008 Principles of Marine Bioacoustics. New York: Springer.

Austin, M., S. Denes, J. MacDonnell, and G. Warner

2016 *Hydroacoustic Monitoring Report, Anchorage Port Modernization Project Test Pile Program*. Prepared by JASCO under contract of Kiewit Infrastructure West Co. for the Port of Anchorage.

Bain, D.E., and R. Williams

2006 *Long-range effects of airgun noise on marine mammals: Response as a function of received sound level and distance*. SC/58/E35.

Barlow, J.

2003 *Preliminary Estimates of the Abundance of Cetaceans along the U.S. West Coast: 1991–2001*. Southwest Fisheries Science Center Administrative Report LJ_03_03. Available from SWFSC, La Jolla, CA.

Blackwell, S.B.

2005 *Underwater measurements of pile-driving sounds during the Port MacKenzie dock modifications, 13–16 August 2004*. Prepared by Greeneridge Sciences, Inc. (Goleta, CA) and LGL Alaska Research Associates, Inc. (Anchorage, AK), in association with HDR Alaska, Inc. (Anchorage, AK) for Knik Arm Bridge and Toll Authority (Anchorage, AK), Alaska Department of Transportation and Public Facilities (Anchorage, AK), and Federal Highway Administration (Juneau, AK). Anchorage, AK.

Blackwell, S.B., and C.R. Greene

2002 *Acoustic measurements in Cook Inlet, Alaska, during August 2001*. Greeneridge Report 271-2. Prepared by Greeneridge Sciences, Inc. (Santa Barbara, CA), for National Marine Fisheries Service, Anchorage, AK.

BOEM (Bureau of Ocean Energy Management)

2016 *Cook Inlet Planning Area, Oil and Gas Lease Sale 244: Final Environmental Impact Statement*. Prepared by U.S. Department of the Interior Bureau of Ocean Energy Management, Alaska OCS Region. OCS EIS/EA BOEM 2016-069.

2021 *Draft Environmental Impact Statement Cook Inlet Planning Area Oil and Gas Lease Sale 258 In Cook Inlet, Alaska*. Bureau of Ocean Energy Management OCS EIS/EA BOEM 2020-063.

2022 *Alaska Outer Continental Shelf. Cook Inlet Planning Area. Oil and Gas Lease Sale 258 in Cook Inlet, Alaska. Final Environmental Impact Statement.*

Boyd, C., R.C. Hobbs, A.E. Punt, K.E.W. Shelden, C.L. Sims, and P.R. Wade

2019 Bayesian estimation of group sizes for a coastal cetacean using aerial survey data. *Marine Mammal Science* 35(4):1322-1346. doi:10/1111/mms.12592.

Boveng, P.L., J.M. London, and J.M. Ver Hoef

2012 *Distribution and abundance of harbor seals in Cook Inlet, Alaska. Task III: Movements, marine habitat use, diving behavior, and population structure, 2004- 2006*. BOEM Report 2012-065. Bureau of Ocean Energy Management, Anchorage, AK.

Brueggeman, J.J., M. Smultea, H. Goldstein, S. McFarland, and D.J. Blatchford

2007 *Spring marine mammal monitoring program for the ConocoPhillips Beluga River seismic operations in Cook Inlet Alaska: 90-day report*. Prepared by Canyon Creek Consulting (Seattle, WA) for ConocoPhillips Alaska, Inc., Anchorage, AK.

Brueggeman, J.J., M. Smultea, K. Lomac-MacNair, D.J. Blatchford, and R. Dimmick

2008a *2007 fall marine mammal monitoring program for the Union Oil Company of California Granite Point seismic operations in Cook Inlet Alaska: 90-day report*. Prepared by Canyon Creek Consulting (Seattle, WA) for Union Oil Company of California.

2008b *2007 fall marine mammal monitoring program for the Marathon Oil Company North Ninilchik seismic operations in Cook Inlet Alaska: 90-day report*. Prepared by Canyon Creek Consulting (Seattle, WA) for Marathon Oil Company.

Brueggeman, J.J., D. Lenz, and M. Wahl

2013 *Beluga Whale and Other Marine Mammal Occurrence in Upper Cook Inlet between Point Campbell and Fire Island, Alaska August–November 2011 and April–July 2012*. Prepared by Jay Brueggeman of Canyon Creek Consulting LLC and Drew Lenz and Melanie Wahl of 61 North Consulting LLC for Cook Inlet Regional Corporation, Anchorage, AK.

Calkins, D.G.

1989 Status of beluga whales in Cook Inlet. Pages 109-112 in L.E. Jarvela, and L.K. Thorsteinson, eds. *Gulf of Alaska, Cook Inlet, and North Aleutian Basin Information Update Meeting. Anchorage, Alaska, Feb. 7–8, 1989*. USDOC, NOAA, OCSEAP, Anchorage, AK.

CALTRANS (California Department of Transportation)

2015 Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish: Appendix I – Compendium of Pile Driving Sound Data. Updated November 2015.

2020 Technical Guidance for Assessment of the Hydroacoustic Effects of Pile Driving on Fish: Appendix I – Compendium of Pile Driving Sound Data. Updated October 2020.

Carlson, T.J., D.L. Woodruff, G.E. Johnson, N.P. Kohn, G.R. Ploskey, M.A. Weiland, J.A. Southard, and S.L. Southard

2005 *Hydroacoustic measurements during pile driving at the Hood Canal Bridge, September through November 2004*. PNWD-3621, Prepared by Battelle Marine Sciences Laboratory for the Washington State Department of Transportation.

Carretta, J.V., K.A. Forney, E.M. Oleson, D.W. Weller, A.R. Lang, J. Baker, M.M. Muto, B. Hanson, A.J. Orr, H. Huber, M.S. Lowry, Jay Barlow, J.E. Moore, D. Lynch, L. Carswell, and R.L. Brownell, Jr.

2019 *U.S. Pacific Marine Mammal Stock Assessments: 2018*. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-617.\

Carretta, J. V., E. M. Oleson, K. A. Forney, D. W. Weller, A. R. Lang, J. Baker, A. J. Orr, B. Hanson, J. Barlow, J. E. Moore, M. Wallen, and R. L. Brownell Jr.

2023 U.S. Pacific marine mammal stock assessments: 2022. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-684. https://doi.org/10.25923/5ysf-gt95

Castellote, M., B. Thayre, M. Mahoney, J. Mondragon, M. O. Lammers, and R. J. Small

2018 Anthropogenic Noise and the Endangered Cook Inlet Beluga Whale, *Delphinapterus leucas*: Acoustic Considerations for Management, *Marine Fisheries Review* 80(3): 63–88

Castellote, M., R.J. Small, M.O. Lammers, J. Jenniges, J. Mondragon, C.D. Garner, S. Atkinson, J.M.S. Delevaux, R. Graham, and D. Westerholt

2020 Seasonal distribution and foraging occurrence of Cook Inlet beluga whales based on passive acoustic monitoring. *Endangered Species Research* 41:225–243.

Chenoweth, E.M., J.M. Straley, M.V. McPhee, S. Atkinson, and S. Reifenstuhl

2017 Humpback whales feed on hatchery-released juvenile salmon. *Royal Society Open Science* 4(7):170–180.

Clark, C.W., W.T. Ellison, B.L. Southall, L. Hatch, S.M. Van Parijs, A. Frankel, and D. Ponirakis

2009 Acoustic masking in marine ecosystems: Intuitions, analysis, and implication. *Marine Ecology Progress Series* 395:201–222.

Coleman, J.

2011. Columbia River Crossing Test Pile Project Hydroacoustic Monitoring Final Report. David Evans and Associates, Inc. July 2011.

Conant, T.A., and A.T. Lohe.

2023. Gray Whale, Western North Pacific Distinct Population Segment (Eschrichtius robustus) 5-Year Review: Summary and Evaluation. NMFS Office of Protected Resources, Silver Spring, MD.

Cornick, L.A., and L. Pinney

2011 *Distribution, habitat use and behavior of Cook Inlet beluga whales and other marine mammals at the Port of Anchorage Marine Terminal Redevelopment Project June – November 2010: Scientific Marine Mammal Monitoring Program 2010 Annual Report.* Prepared by Alaska Pacific University (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC); Port of Anchorage (Anchorage, AK); and Integrated Concepts & Research Corporation (Anchorage, AK). Anchorage, AK.

Cornick, L.A., and L. Saxon-Kendall

2008 *Distribution, habitat use, and behavior of Cook Inlet beluga whales in Knik Arm, Fall 2007.* Final annual report for 2007. Prepared by Alaska Pacific University (Anchorage, AK) for Integrated Concepts & Research Corporation, Anchorage, AK.

2009 *Distribution, habitat use, and behavior of Cook Inlet beluga whales and other marine mammals at the Port of Anchorage Marine Terminal Redevelopment Project, June–November, 2008*. Scientific Marine Mammal Monitoring Report for 2008. Report from Alaska Pacific University, Department of Environmental Science. Prepared for U.S. Department of Transportation Maritime Administration, Washington, DC; Port of Anchorage, Anchorage; and Integrated Concepts and Research Corporation, Anchorage, AK.

Cornick, L., and D.J. Seagars
2016 *Final Report: Anchorage Port Modernization Project Test Pile Program*. Technical Report by AECOM for Kiewit.

Cornick, L.A., L. Saxon-Kendall, and L. Pinney
2010 *Distribution, habitat use and behavior of Cook Inlet beluga whales and other marine mammals at the Port of Anchorage Marine Terminal Redevelopment Project May – November, 2009: Scientific Marine Mammal Monitoring Program 2009 annual report*. Prepared by Alaska Pacific University (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC); Port of Anchorage (Anchorage, AK); and Integrated Concepts & Research Corporation (Anchorage, AK). Anchorage, AK.

Cornick, L., S. Love, L. Pinney, C. Smith, and Z. Zartler
2011 *Distribution, habitat use and behavior of Cook Inlet beluga whales and other marine mammals at the Port of Anchorage Marine Terminal Redevelopment Project June - November 2011: Scientific Marine Mammal Monitoring Program 2011 Annual Report.* Prepared by Alaska Pacific University (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC); Port of Anchorage (Anchorage, AK); and Integrated Concepts & Research Corporation (Anchorage, AK). Anchorage, AK.

DAF (Department of the Air Force)
2022 *JBER Proposed Mortar and Artillery Training at Richardson Training Area Environmental Impact Statement*. Available online at https://jber-pmart-eis.com/#!/home, accessed 2 December 2022

Dahlheim, M., A. York, R. Towell, J. Waite, and J. Breiwick
2000 Harbor porpoise (*Phocoena phocoena*) abundance in Alaska: Bristol Bay to Southeast Alaska, 1991–1993. *Marine Mammal Science* 16:28–45.

Discovery of Sound in the Sea
2019 What are common underwater sounds? Website. Accessed April 2019 https://dosits.org/science/sounds-in-the-sea/what-are-common-underwater-sounds/

Eagleton, M.
2016 Personal communication between Matt Eagleton (NMFS) and Erin Cunningham (HDR) regarding EFH designations in the SBS Project area and throughout Cook Inlet, 01 September 2016.

Easley-Appleyard, B. and K. E. Leonard
2022 NMFS Port of Alaska visual monitoring project report. U.S. Dept. of Commerce, NOAA, NMFS, Alaska Region, Protected Resources Division, Anchorage, AK, December 2022, 42 p.

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

Everitt, R.D., C.H. Fiscus, and R.L. DeLong
1980 *Northern Puget Sound Marine Mam*mals.EPA-600/7-80-139. NOAA, NMFS, National Marine Mammal Laboratory, Seattle, WA.

Finneran, J.J., C.E. Schlundt, D.A. Carder, J.A. Clark, J.A. Young, J.B. Gaspin, and S.H. Ridgway.
2000 Auditory and behavioral responses of bottlenose dolphins (*Tursiops truncatus*) and a beluga whale (*Delphinapterus leucas*) to impulsive sounds resembling distant signatures of underwater explosions. *Journal of the Acoustical Society of America* 108:417–431.

Finneran, J.J., C.E. Schlundt, R. Dear, D.A. Carder, and S.H. Ridgway.
2002 Temporary shift in masked hearing thresholds in odontocetes after exposure to single underwater impulses from a seismic watergun. *Journal of the Acoustical Society of America* 111(6):2929–2940.

Funk, D.W., T.M. Markowitz, and R. Rodrigues (eds.)
2005 *Baseline studies of beluga whale habitat use in Knik Arm, Upper Cook Inlet, Alaska, July 2004-July 2005.* Prepared by LGL Alaska Research Associates, Inc. (Anchorage, AK) in association with HDR Alaska, Inc. (Anchorage, AK) for Knik Arm Bridge and Toll Authority (Anchorage, AK), Department of Transportation and Public Facilities (Anchorage, AK), and Federal Highway Administration (Juneau, AK). Anchorage, AK.

George, K.
2020 Another gray whale found dead in Cook Inlet, scientists still aren't sure what's causing the die-off. *Alaska Public Media*. 9 July 2020. Accessed Available online at https://alaskapublic.org/2020/07/09/another-gray-whale-found-dead-in-cook-inlet-scientists-still-arent-sure-whats-causing-the-die-off/.

Giefer, J., and B. Blossom.
2020 *Catalog of waters important for spawning, rearing, or migration of anadromous fishes – Southcentral Region, effective June 1, 2020*. Alaska Department of Fish and Game, Special Publication No. 20-03, Anchorage.

Goetz, K.T., R.A. Montgomery, J.M. Ver Hoef, R.C. Hobbs, and D.S. Johnson.
2012b Identifying essential summer habitat of the endangered beluga whale *Delphinapterus leucas* in Cook Inlet, Alaska. *Endangered Species Research* 16:135–147.

Goetz, K.T., K.E.W. Shelden, C.L. Sims, J.M. Waite, and P.R. Wade
2023 *Abundance of belugas (*Delphinapterus leucas*) in Cook Inlet, Alaska, June 2021 and June 2022*. AFSC Processed Report 2023-03, 47 p. Alaska Fisheries Science Center, NOAA, National Marine Fisheries Service, Seattle, WA.

Hastings, M.C., and A.N. Popper
2005 *Effects of sound on fish*. Technical report for Jones and Stokes to California Department of Transportation.

Hazen, E.L., A.S. Friedlaender, M.A. Thompson, C.R. Ware, M.T. Weinrich, P.N. Halpin, and D.N. Wiley
2009 Fine-scale prey aggregations and foraging ecology of humpback whales *Megaptera novaeangliae*. *Marine Ecology Progress Series* 395:75–89.

HDR

2015 *Biological Assessment*. Seward Highway Milepost 75 to 90 Road and Bridge Rehabilitation Project. Prepared for the State of Alaska Department of Transportation and Public Facilities by HDR.

Hobbs, R.C.

2013 Detecting Changes in Population Trends for Cook Inlet Beluga Whales (*Delphinapterus leucas*) Using Alternative Schedules for Aerial Surveys. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-252.

Hobbs, R.C., and K.E.W. Shelden

2008 *Supplemental Status Review and Extinction Assessment of Cook Inlet Belugas (*Delphinapterus leucas*)*. AFSC Processed Report 2008-08. Alaska Fisheries Science Center, National Marine Fisheries Service, Seattle, WA.

Hobbs, R.C., and J.M. Waite

2010 Abundance of harbor porpoise (*Phocoena phocoena*) in three Alaskan regions, corrected for observer errors due to perception bias and species misidentification, and corrected for animals submerged from view. *Fishery Bulletin* 108:251-267.

Hobbs, R.C., D.J. Rugh, and D.P. DeMaster

2000b Abundance of belugas, *Delphinapterus leucas*, in Cook Inlet, Alaska, 1994–2000. *Marine Fisheries Review* 62(3):37–45.

Hobbs, R.C., K.L. Laidre, D.J. Vos, B.A. Mahoney, and M. Eagleton

2005 Movements and area use of belugas, *Delphinapterus leucas*, in a subarctic Alaskan estuary. *Arctic* 58(4):331–340.

Hobbs, R.C., K.E.W. Shelden, D.J. Rugh, and S.A. Norman

2008 *2008 Status Review and Extinction Risk Assessment of Cook Inlet Belugas (*Delphinapterus leucas*)*. AFSC Processed Report 2008-02. National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA. Available online at https://apps-afsc.fisheries.noaa.gov/Publications/ProcRpt/PR%202008-02.pdf.

Hobbs, R.C., C.L. Sims, and K.E.W. Shelden

2011 *Estimated abundance of belugas in Cook Inlet, Alaska, from aerial surveys conducted in June 2011*. NMFS, NMML Unpublished Report.

2012 *Estimated abundance of belugas in Cook Inlet, Alaska, from aerial surveys conducted in June 2012.* NMFS, NMML Unpublished Report.

Houghton, J., J. Starkes, M. Chambers, and D. Ormerod

2005 *Marine fish and benthos studies in Knik Arm, Anchorage, Alaska.* Prepared by Pentec Environmental (Edmonds, WA) for Knik Arm Bridge and Toll Authority and HDR Alaska, Inc., Anchorage, AK.

I&R (Illingworth & Rodkin, LLC)

2017 Pile Driving Noise Measurements at Atlantic Fleet Naval Installations: 28 May 2013 - 28 April 2016. Final Report. Submitted by HDR to NAVFAC Atlantic. Contract No. N62470-10-D-3011, Task Order CTO33.

2021a *Port of Alaska Modernization Program, Petroleum and Cement Terminal Hydroacoustic Monitoring Report*. Prepared for the Port of Alaska, Anchorage, AK, by Illingworth & Rodkin, Cotati, CA. March 2021.

2021b *Port of Alaska Modernization Program, Petroleum and Cement Terminal Phase 2* Hydroacoustic *Monitoring Report*. Prepared for the Port of Alaska, Anchorage, AK, by Illingworth & Rodkin, Cotati, CA. November 2021.

2023 Memo: Vibratory Pile Removal Sound Source Levels and Air Bubble Curtain Performance. Submitted to Suzann Speckman. March 22, 2023.

ICRC (Integrated Concepts & Research Corporation)

2009 *Marine mammal monitoring final report 15 July 2008 through 14 July 2009.* Construction and scientific marine mammal monitoring Associated with the Port of Anchorage Marine Terminal Redevelopment Project, in accordance with the 15 July 2008 National Marine Fisheries Service Incidental Harassment Authorization. Prepared by Integrated Concepts & Research Corporation (Anchorage, AK) for Maritime Administration (Washington, DC) and Port of Anchorage (Anchorage, AK). Anchorage, AK.

2010 *2009 Annual marine mammal monitoring report.* Construction and scientific marine mammal monitoring Associated with the Port of Anchorage Marine Terminal Redevelopment Project, in accordance with the USACE 404/10 Permit and the NMFS 2009 Letter of Authorization. Prepared by Integrated Concepts & Research Corporation (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC) and Port of Anchorage (Anchorage, AK). Anchorage, AK.

2011 *2010 Annual marine mammal monitoring report.* Construction and Scientific Marine Mammal Monitoring Associated with the Port of Anchorage Marine Terminal Redevelopment Project, in accordance with the USACE 404/10 Permit and the NMFS 2010-2011 Letter of Authorization. Prepared by Integrated Concepts & Research Corporation (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC) and Port of Anchorage (Anchorage, AK). Anchorage, AK.

2012 *2011 Annual marine mammal monitoring report*. Construction and Scientific Marine Mammal Monitoring Associated with the Port of Anchorage Marine Terminal Redevelopment Project, in accordance with the Letter of Authorization issued by the National Marine Fisheries for July 15, 2011 through July 14, 2012. Prepared by Integrated Concepts & Research Corporation (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC) and Port of Anchorage (Anchorage, AK). Anchorage, AK.

IPCC (Intergovernmental Panel on Climate Change)

2023 *Summary for Policymakers. In: Climate Change 2023: Synthesis Report. A report of the Intergovernmental Panel on Climate Change.* Contribution of Working Groups I, II, and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 36 pages (in press)

Ireland, D.S., D.W. Funk, T.M. Markowitz, and C.C. Kaplan

2005 *Beluga whale distribution and behavior in Eagle Bay and the Sixmile area of upper Cook Inlet, Alaska, in September and October 2005.* Prepared by LGL Alaska Research Associates, Inc. (Anchorage, AK) in association with HDR Alaska, Inc. (Anchorage, AK) for Knik Arm Bridge and Toll Authority (Anchorage, AK), Alaska Department of Transportation and Public Facilities (Anchorage, AK), and Federal Highway Administration (Juneau, AK). Anchorage, AK.

Kendall, L.S., and L.A. Cornick

2015 Behavior and distribution of Cook Inlet beluga whales, *Delphinapterus leucas*, before and during pile driving activity. *Marine Fisheries Review* 77(2):106–114.

Kenai Peninsula Borough

2003 *Kenai Peninsula Borough Transportation Plan*. Final Plan. Prepared by HDR Alaska, Inc. (Anchorage, AK) in association with Kittelson & Associates, Inc. (Portland, OR) for the Kenai Peninsula Borough.

Krieger, K.J., and B.L. Wing

1984 *Hydroacoustic Surveys and Identification of Humpback Whale Forage in Glacier Bay, Stephens Passage, and Frederick Sound, Southeastern Alaska, Summer 1983*. U.S. Department of Commerce, NOAA Technical Memo NMFS/NWC-66.

Laidre, K.L., K.E.W. Shelden, D.J. Rugh, and B.A. Mahoney

2000 Beluga, *Delphinapterus leucas*, distribution and survey effort in the Gulf of Alaska. *Marine Fisheries Review* 62:27–36.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta

2001 Collisions between ships and whales. *Marine Mammal Science* 17:35–75.

LGL Alaska Research Associates, Inc., and DOWL

2015 *Biological Assessment of the Cook Inlet Beluga Whale (*Delphinapterus leucas*) for the Seward Highway MP 105-107 Windy Corner Project, Municipality of Anchorage, Upper Cook Inlet, Alaska.* Prepared for State of Alaska Department of Transportation and Public Facilities, Central Region.

Lomac-MacNair, K., M.A. Smultea, and G. Campbell

2014 *Draft NMFS 90-Day Report for Marine Mammal Monitoring and Mitigation during Apache's Cook Inlet 2014 Seismic Survey, 2 April – 27 June 2014*. Prepared for Apache Alaska Corporation, Anchorage AK. Prepared by Smultea Environmental Sciences (SES), Preston, WA.

Lopez, J.W., T.B. Parr, D.C. Allen, and C.C. Vaughn.

2020. Animal aggregations promote emergent aquatic plant production at the aquatic-terrestrial interface. Ecology. 101(10). Available online at https://doi.org/10.1002/ecy.3126.

Markowitz, T.M., and T.L. McGuire (eds.)

2007 *Temporal-spatial distribution, movements and behavior of beluga whales near the Port of Anchorage, Alaska*. Prepared by LGL Alaska Research Associates, Inc. (Anchorage, AK) for Integrated Concepts & Research Corporation, Anchorage, AK.

Martien, Karen K., Barbara L. Taylor, Frederick I. Archer, Katherina Audley, John Calambokidis, Ted Cheeseman, Joëlle De Weerdt, Astrid Frisch Jordán, Pamela Martínez-Loustalot, Christian D. Ortega-Ortiz, Eric M. Patterson, Nicola Ransome, Penny Ruvelas, Jorge Urbán Ramírez, and Francisco Villegas-Zurita

2021 *Evaluation of Mexico Distinct Population Segment of Humpback Whales as units under the Marine Mammal Protection Act*. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-658.

Martinez-Aguilar, S.
2011 Abundancia y tasa de incremento de la ballena jorobada Megaptera novaeangliae en el Pacífico Mexicano. M.Sc. Thesis, Universidad Autónoma de Baja California Sur, La Paz, Baja California Sur, Mexico. 92 pp.

McDowell
2020 *The Logistical Advantages of Alaska's Primary Inbound Port.* October 2020.

McGuire, T., A. Stephens, and B. Goetz
2016 The Susitna river delta as a calving ground: Evidence from observation of a Cook Inlet beluga birth and the 2005-2015 seasonal and geographic patterns of neonate occurrence in upper Cook Inlet. Poster presented at Alaska Marine Science Symposium.

McGuire, T., G. Himes Boor, J. McClung, A.D. Stephens, C. Garner. K.E.W. Shelden, and B Wright
2020 Distribution and habitat use by endangered Cook Inlet beluga whales: Patterns observed during a photo-identification study, 2005-2017. *Aquatic Conservation: Marine Freshwater Ecosystem* 30(12):2402–2427.

McPherson, R., and R. Beebee
2023 *Concept-level offshore sediment disposal assessment of NES1 material*. Technical Memorandum. HDR. May 2023.

Miller, G.W., V.D. Moulton, R.A. Davis, M. Holst, P. Millman, A. MacGillivray, and D. Hannay
2005 Monitoring seismic effects on marine mammals – southeastern Beaufort Sea, 2001-2002. In: *Offshore oil and gas environmental effects monitoring: approaches and technologies.* S.L. Armsworthy, P.J. Crandfor, and K. Lee (eds.). Battelle Press, Columbus, OH.

Montgomery, R.A., J.M. Ver Hoef, and P.L Boveng
2007 Spatial modeling of haul-out site use by harbor seals in Cook Inlet, Alaska. *Marine Ecology Progress Series* 341:257–264.

Moore, S.E., K.E.W. Shelden, L.L. Litzky, B.A. Mahoney, and D.J. Rugh
2000 Beluga, *Delphinapterus leucas*, habitat associations in Cook Inlet, Alaska. *Marine Fisheries Review* 62:60–80.

Moore, S.E., J.M. Grebmeier, and J.R. Davies
2003 Gray whale distribution relative to forage habitat in the northern Bering Sea: current conditions and retrospective summary. *Canadian Journal of Zoology* 81(4):734–742.

Moulton, L.L.
1997 Marine residence, growth, and feeding by juvenile salmon in northern Cook Inlet, Alaska. *Alaska Fishery Research Bulletin* 4(2):154–177.

Muto, M.M., V.T. Helker, B.J. Delean, N.C. Young, J.C. Freed, R.P. Angliss, N A. Friday, P.L. Boveng, J.M. Breiwick, B.M. Brost, M.F. Cameron, P.J. Clapham, J.L. Crance, S.P. Dahle, M.E. Dahlheim, B.S. Fadely, M.C. Ferguson, L.W. Fritz, K.T. Goetz, R.C. Hobbs, Y.V. Ivashchenko, A.S. Kennedy, J.M. London, S.A. Mizroch, R.R. Ream, E.L. Richmond, K.E.W. Shelden, K.L. Sweeney, R.G. Towell, P.R. Wade, J.M. Waite, and A.N. Zerbini.
2022 *Alaska Marine Mammal Stock Assessments, 2021*. U.S. Department of Commerce, NOAA Technical Memorandum NMFSAFSC-441.

Nedwell, J., and B. Edwards
2002 *Measurements of underwater noise in the Arun River during piling at County Wharf, Littlehampton*.

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

Nemoto, T.
1957 Foods of the baleen whales of the northern Pacific. *Scientific Reports of the Whale Research Institute* 12(1957):33–89.

NMFS (National Marine Fisheries Service)
2003 *Subsistence Harvest Management of Cook Inlet Beluga Whales - Final Environmental Impact Statement.* Available online at https://repository.library.noaa.gov/view/noaa/19217
2016a Nearshore Fish Atlas of Alaska. Available online at https://alaskafisheries.noaa.gov/mapping/szflex/index.html?T=FA@L=B. Accessed 15 February 2021.
2016b *Recovery Plan for the Cook Inlet Beluga Whale (*Delphinapterus leucas*).* National Marine Fisheries Service, Alaska Regional Office, Protected Resources Division, Juneau, AK.
2018a *2018 Revisions to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 2.0): Underwater thresholds for onset of permanent and temporary threshold shifts*. U.S. Department of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-59.
2018b *Port of Alaska, 2018 Fender Pile Replacement and Repair, Knik Arm, Anchorage, Alaska*. NMFS PCTS Number: AKR-2018-9778. National Marine Fisheries Service, Alaska Regional Office, Protected Resources Division, Juneau, AK.
2019 Reviewing and designating stocks and issuing Stock Assessment Reports under the Marine Mammal Protection Act. Protected Resources Policy 02-204-03. Available online: https://media.fisheries.noaa.gov/dam-migration/02-204-03.pdf.
2020a Biological Opinion for the Port of Alaska's Petroleum and Cement Terminal, Anchorage, Alaska. National Marine Fisheries Service, Alaska Region. 13 March 2021.
2020b Incidental Harassment Authorization for the Port of Alaska's Petroleum and Cement Terminal Phase 1, Anchorage, Alaska. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland. 31 March 2020.
2020c Incidental Harassment Authorization for the Port of Alaska's Petroleum and Cement Terminal Phase 2, Anchorage, Alaska. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland. 31 March 2020.
2020d *User Spreadsheet Tool (Version 2.1) for: 2018 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts*. Silver Spring, Maryland: Office of Protected Resources, National Marine Fisheries Service.
2022a *Beluga Whale – Cook Inlet DPS (*Delphinapterus leucas*) 5-Year Review: Summary and Evaluation*. NOAA Fisheries, Alaska Region, Anchorage, AK, and National Marine Fisheries Service Alaska Fisheries Science Center, Seattle, WA. August 2022.
2022b Essential Fish Habitat Mapper for Alaska. Available online at https://www.habitat.noaa.gov/apps/efhmapper/.
2022c Evaluation of MMPA Stock Designation for the Hawai'i Distinct Population Segment of humpback whales (Megaptera novaeangliae), currently a part of the Central North Pacific

humpback whale stock. Memorandum for the Record: Management Considerations in Designating Demographically Independent Populations as Stocks under the Marine Mammal Protection Act.

2022d Evaluation of MMPA Stock Designation for the Mexico Distinct Population Segment of humpback whales (Megaptera novaeangliae), currently a part of the California/Oregon/Washington and Central North Pacific (CNP) humpback whale stocks. National Marine Fisheries Service Memorandum for the Record: Management Considerations in Designating Demographically Independent Populations as Stocks under the Marine Mammal Protection Act.

2022e 2019-2023 Gray Whale Unusual Mortality Event along the West Coast and Alaska. National Oceanic and Atmospheric Administration. Accessed 29 September 2023. Available online at https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2023-gray-whale-unusual-mortality-event-along-west-coast-and

2023 Biological Opinion for the Port of Alaska North Extension Stabilization Step 1, Anchorage, Alaska. National Marine Fisheries Service, Alaska Region. 15 December 2023.

NPFMC (North Pacific Fishery Management Council)

2016 *Fishery Management Plan for Groundfish of the Gulf of Alaska*. National Marine Fisheries Service Alaska Region, State of Alaska Department of Fish and Game. November 2016.

2020 *Fishery Management Plan for Groundfish of the Gulf of Alaska*. North Pacific Fishery Management Council, Anchorage, Alaska. November 2020.

2021 *Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska*. North Pacific Management Council, National Marine Fisheries Service Alaska Region, State of Alaska Department of Fish and Game. North Pacific Fishery Management Council, Anchorage, AK. November 2021.

Oestman, R., D. Buehler, J. Reyff, and R. Rodkin

2009 Technical guidance for assessment and mitigation of the hydroacoustic effects of pile driving on fish. Prepared by ICF Jones & Stokes and Illingworth & Rodkin, Inc., for the California Department of Transportation.

Parks, S.E., C.W. Clark, and P.L. Tyack

2007 Short- and long-term changes in right whale calling behavior: the potential effects of noise on acoustic communication. *Journal of the Acoustical Society of America* 122(6):3725–3731.

Pebble Limited Partnership

2021 *PLP Files Request for Appeal on USACE Record of Decision for the Pebble Project.* Press release, 21 January 2021.

POA (Port of Anchorage)

2009 *Biological Assessment of the Beluga Whale Delphinapterus leucas in Cook Inlet for the Port of Anchorage Expansion Project and Associated Dredging at the Port of Anchorage, Alaska.* Prepared by the Port of Anchorage; U.S. Department of Transportation, Maritime Administration; and U.S. Army Corps of Engineers, Anchorage, AK.

2014 Port of Anchorage. Alaska's Port. Alaska's Future.

2017 Anchorage Port Modernization Program, Petroleum and Cement Terminal: Application for a Marine Mammal Protection Act Incidental Harassment Authorization. Prepared by HDR, Inc., Anchorage, AK; and Illingworth & Rodkin, Petaluma, CA; for the Port of Anchorage under contract to CH2M.

2019a Port Infrastructure Development Program Fiscal Year 2019, Port of Alaska-Petroleum Cement Terminal. Port Infrastructure Development Grant Application. 16 September 2019.

2019b Port of Alaska, Final Marine Mammal Observation Report, POA-2003-0502 M-13 Knik Arm. Prepared for USACE Alaska District and NMFS.

2020 Port of Alaska Letter to U.S. Army Corps of Engineers Re: Support of Initiation of Informal Consultation under Section 7(a)(2) of the Endangered Species Act (ESA). POA-1977-00144. Dated 25 September 2020.

2021 Port of Alaska Modernization Program, South Floating Dock: Application for a Marine Mammal Protection Act Incidental Harassment Authorization. Submitted to NMFS 05 March 2021. Prepared by HDR, Inc., Anchorage, AK; and Illingworth & Rodkin, Petaluma, CA; for the Port of Anchorage under contract to Jacobs.

2023a Port of Alaska Modernization Program, North Extension Stabilization (Step 1) Project: Application for a Marine Mammal Protection Act Incidental Harassment Authorization. Prepared by HDR, Inc., Anchorage, AK; and Illingworth & Rodkin, Petaluma, CA; for the Port of Alaska under contract to CH2M HILL now Jacobs.

2023b *Port of Alaska Modernization Program, North Extension Stabilization 1: Marine Mammal Monitoring and Mitigation Plan*. Prepared by HDR, Inc., Anchorage, AK; for the Port of Alaska under contract to Jacobs.

2023c *Port of Alaska Modernization Program Essential Fish Habitat Technical Report – North Extension Stabilization Step 1 (NES1) Project*. Prepared by HDR, Inc., Anchorage, AK, for the Port of Alaska under contract to Jacobs.

2023d Port of Alaska Modernization Program North Extension Stabilization Step 1: Biological Assessment. Submitted to the USACE 12 October 2023. Prepared by HDR, Inc., Anchorage, AK, for the Port of Alaska under contract to Jacobs.

Poux, Sabine

2022 Another tidal energy project planned for Cook Inlet. KDLL. May 23, 2022. Available online at https://www.kdll.org/local-news/2022-05-23/another-tidal-energy-project-planned-for-cook-inlet. Accessed 12 September 2022.

Prevel-Ramos, A.P., T.M. Markowitz, D.W. Funk, and M.R. Link

2006 *Monitoring beluga whales at the Port of Anchorage: Pre-expansion observations, August-November 2005*. Prepared by LGL Alaska Research Associates, Inc. (Anchorage, AK) for Integrated Concepts & Research Corporation; Port of Anchorage; and U.S. Department of Transportation, Maritime Administration. Anchorage, AK.

Quakenbush, L.T., R.S. Suydam, A.L. Bryan, L.F. Lowry, K.J. Frost, and B.A. Mahoney

2015 Diet of beluga whales *Delphinapterus leucas,* in Alaska from Stomach Contacts, March–November. *Marine Fisheries Review* 77(1):70–84.

Richardson, W.J., C.R. Greene Jr., W.R. Koski, C.I. Malme, G.W. Miller, M.A. Smultea, and B. Würsig

1990 *Acoustic Effects of Oil Production Activities on Bowhead and White Whales Visible During Spring Migration Near Pt. Barrow, Alaska – 1989 Phase: Sound Propagation and Whale Responses to Playbacks of Continuous Drilling Noise from an Ice Platform, as Studied in Pack Ice Conditions.* OCS Study MMS 90-0017. Prepared by LGL Ltd., King City, ON for U.S. Mineral Management Service, Herndon, VA. Available online at http://www.arlis.org/docs/vol1/A/22570440.pdf.

Richardson, W.J., C.R. Greene, Jr., W.R. Koski, M.A. Smultea, G. Cameron, C. Holdsworth, G. Miller, T. Woodley, and B. Würsig

1991 *Acoustic Effects of Oil Production Activities on Bowhead and White Whales Visible During Spring Migration Near Pt. Barrow, Alaska – 1990 Phase: Sound Propagation and Whale Responses to Playbacks of Continuous Drilling Noise from an Ice Platform, as Studied in Pack Ice Conditions.* OCS Study MMS 91-0037. Prepared by LGL Ltd., King City, ON for U.S. Mineral Management Service, Herndon, VA. Available online at http://www.arlis.org/docs/vol1/A/25156606.pdf.

Richardson, W.J., C.R. Greene, C.I. Malme, and D.H. Thomson

1995a *Marine Mammals and Noise.* Academic Press, Inc., San Diego, CA.

Richardson, W.J., C.R. Greene Jr., J.S. Hanna, W.R. Koski, G.W. Miller, N.J. Patenaude and M.A. Smultea, with R. Blaylock, R. Elliott, and B. Würsig

1995b *Acoustic effects of oil production activities on bowhead and white whales visible during spring migration near Pt. Barrow, Alaska – 1991 and 1994 phases.* OCS Study MMS 95-0051; NTIS PB98-107667. LGL Rep. TA954. Prepared by LGL Ltd., King City, Ont., for U.S. Minerals Management Service, Herndon, VA.

Rugh, D.J., K.E.W. Shelden, and B.A. Mahoney

2000 Distribution of belugas, *Delphinapterus leucas*, in Cook Inlet, Alaska, during June/July, 1993-2000. *Marine Fisheries Review* 62:6–21.

Rugh, D.J., B.A. Mahoney, C.L. Sims, B.K. Smith, and R.C. Hobbs

2003 Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2003. Unpubl. NMFS report.

Rugh, D.J., B.A. Mahoney, and B.K. Smith

2004a *Aerial Surveys of Beluga Whales in Cook Inlet, Alaska, between June 2001 and June 2002*. NOAA Technical Memorandum NMFS-AFSC-145. National Marine Fisheries Service, Seattle, WA.

Rugh, D.J., B.A. Mahoney, C.L. Sims, B.A. Mahoney, B.K. Smith, and R.C. Hobbs

2004b Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2004. Unpubl. NMFS report.

Rugh, D.J., K.E.W. Shelden, C.L. Sims, B.A. Mahoney, B.K. Smith, L.K. Litzky, and R.C. Hobbs

2005a *Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2001, 2002, 2003, and 2004*. NOAA Technical Memorandum NMFS-AFSC-149. National Marine Fisheries Service, Seattle, WA.

Rugh, D. J., K.T. Goetz, and B.A. Mahoney

2005b Aerial Surveys of Belugas in Cook Inlet, Alaska, August 2005. Unpubl. NMFS report.

Rugh, D. J., K.T. Goetz, B.A. Mahoney, B.K. Smith, and T.A. Ruszkowski

2005c Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2005. Unpubl. NMFS report.

Rugh, D.J., K.T. Goetz, C.L. Sims, and B.K. Smith

2006a Aerial Surveys of Belugas in Cook Inlet, Alaska, August 2006. Unpubl. NMFS report.

Rugh, D.J., K.T. Goetz, C.L. Sims, K.E.W. Shelden, O.V. Shpak, B.A. Mahoney, and B.K. Smith

2006b Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2006. Unpubl. NMFS report.

Rugh, D.J., K.T. Goetz, J.A. Mocklin, B.A. Mahoney, and B.K. Smith
2007 Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2007. Unpubl. NMFS report.

Saxon Kendall, L., A. Širović, and E.H. Roth
2013 Effects of construction noise on the Cook Inlet beluga whale (*Delphinapterus leucas*) vocal behavior. *Canadian Acoustics* 41(3):3–13.

Schlundt, C.E., J.J. Finneran, D.A. Carder, and S.H. Ridgway
2000 Temporary shift in masked hearing thresholds (MTTS) of bottlenose dolphins and white whales after exposure to intense tones. *Journal of the Acoustical Society of America* 107:3496–3508.

Scientific Fishery Systems, Inc.
2009 *2008 Underwater Noise Survey During Construction Pile Driving*. Prepared by SFS under contract to Integrated Concepts and Research Corporation (ICRC), Anchorage, Alaska, for the Port of Anchorage, Marine Terminal Development Project.

Sheldon, K., and P. Wade (eds).
2019 *Aerial surveys, distribution, abundance, and trend of belugas* (Delphinapterus leucas) *in Cook Inlet, Alaska, June 2018*. AFSC Processed Rep. 2019-09, Alaska Fisheries Science Center, NOAA, NMFS, Seattle, WA.

Shelden, K.E.W., D.J. Rugh, B.A. Mahoney, and M.E. Dahlheim
2003 Killer whale predation on belugas in Cook Inlet, Alaska: Implications for a depleted population. *Marine Mammal Science* 19(3):529–544.

Shelden, K.E.W., D.J. Rugh, K.T. Goetz, C.L. Sims, L. Vate Brattström, J.A. Mocklin, B.A. Mahoney, B.K. Smith, and R.C. Hobbs
2013 *Aerial surveys of beluga whales*, Delphinapterus leucas, *in Cook Inlet, Alaska, June 2005 to 2012*. NOAA Technical Memorandum NMFS-AFSC-263. National Marine Fisheries Service, Seattle, WA.

Shelden, K.E.W., B.A. Agler, J.J. Brueggeman, L.A. Cornick, S.G. Speckman, and A. Prevel- Ramos
2014 Harbor porpoise, *Phocoena phocoena vomerina*, in Cook Inlet, Alaska. *Marine Fisheries Review* 76:22–50.

Shelden, K.E.W., C.L. Sims, L.V. Brattstrom, K.T. Goetz, and R.C. Hobbs
2015 *Aerial Surveys of Beluga Whales (*Delphinapterus leucas*) in Cook Inlet, Alaska, June 2014*. AFSC Processed Rep. 2015-03. Alaska Fisheries Science Center, NOAA, NMFS, Seattle, WA.

Shelden, K.E.W., R.C. Hobbs, C.L. Sims, L. Vate Brattström, J.A. Mocklin, C. Boyd, and B.A. Mahoney
2017 *Aerial surveys, abundance, and distribution of beluga whales* (Delphinapterus leucas) *in Cook Inlet, Alaska, June 2016*. AFSC Processed Rep. 2017-09, Alaska Fisheries Science Center, NOAA, NMFS, 7600 Sand Point Way NE, Seattle WA 98115.

Shelden, K.E.W., K.T. Goetz, A.A. Brower, A.L. Willoughby, and C.L. Sims
2022 *Distribution of belugas (*Delphinapterus leucas*) in Cook Inlet, Alaska, June 2021 and June 2022*. AFSC Processed Rep. 2022-04, 80 p. Alaska Fish. Sci. Cent., NOAA, NMFS, Seattle, WA.

Shields, P., and A. Dupuis.

2017. Upper Cook Inlet commercial fisheries annual management report, 2016. Alaska Department of Fish and Game, Fishery Management Report No. 17-05, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR17-05.pdf

Silber, G.K., D.W. Weller, R.R. Reeves, J.D. Adams, and T.J. Moore

2021 Co-occurrence of gray whales and vessel traffic in the North Pacific Ocean. *Endangered Species Research* 44:177–201.

Širović, A., and L.S. Kendall

2009 *Passive acoustic monitoring of Cook Inlet beluga whales: Analysis report, Port of Anchorage Marine Terminal Redevelopment Project.* Prepared for U.S. Department of Transportation, Maritime Administration (Washington, DC); Port of Anchorage (Anchorage, AK); and Integrated Concepts & Research Corporation (Anchorage, AK). Anchorage, AK.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack

2007 Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals*, Special Issue 33.

Southall, B., L., J.J. Finneran, C. Reichmuth, P.E. Nachtigall, D.R. Ketten, A.E. Bowles, W.T. Ellison, D.P. Nowacek, and P.L. Tyack

2019 Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. *Aquatic Mammals* 45(2):125–232.

Swartz, S.L.

2018 Gray whale: Eschrichtius robustus. In: Würsig, B., Thewissen, J.G.M., Kovacs, K. (eds) *Encyclopedia of Marine Mammals*, 3rd edition, pp. 422−428. Academic Press, Cambridge, MA.

Sweeney, K., B. Birkemeier, K. Luxa, and T. Gelatt

2022 Results of Steller sea lion surveys in Alaska, June–July 2021. Memorandum to The Record. February 2022. Available online at https://media.fisheries.noaa.gov/2022-02/ssl_aerial_survey_2021_final.pdf.

Thorson, P., and J. Reyff

2006 San Francisco-Oakland Bay bridge east span seismic safety project marine mammals and acoustic monitoring for the marine foundations at piers E2 and T1.

URS (URS Corporation)

2007 *Port of Anchorage Marine Terminal Development Project underwater noise survey test pile driving program, Anchorage, Alaska*. Prepared for Integrated Concepts & Research Corporation, Anchorage, AK.

2008 Application for 2008 Incidental Harassment Authorization for construction activities associated with the Port of Anchorage Marine Terminal Redevelopment Project. Prepared for U.S. Department of Transportation, Maritime Administration (Washington, DC); Port of Anchorage (Anchorage, AK); and Integrated Concepts & Research Corporation (Anchorage, AK). Anchorage, AK.

U.S. Army Garrison Fort Richardson

2009 *Biological Assessment of the Cook Inlet beluga whale (Delphinapterus leucas) for the resumption of year-round firing in Eagle River Flats Impact Area*. U.S. Department of Army, Fort Richardson, AK.

U.S. Navy

2012 Naval Base Kitsap at Bangor Test Pile Program: Acoustic Monitoring Report. Bangor, Washington. 17 April, 2012. Prepared by: Illingworth and Rodkin, Inc.

2015 *Proxy source sound levels and potential bubble curtain attenuation for acoustic modeling of nearshore marine pile driving at Navy installations in Puget Sound*. Prepared by Michael Slater, Naval Surface Warfare Center, Carderock Division, and Sharon Rainsberry, Naval Facilities Engineering Command Northwest. Revised January 2015.

USACE (U.S. Army Corps of Engineers)

2008 *Environmental Assessment and Findings of No Significant Impact*. Anchorage Harbor Dredging and Disposal, Anchorage, AK.

2020a *Pebble Project Final Environmental Impact Statement*. Department of the Army.

2020b Letter from David Hobbie, Chief, Regional Regulatory Division, to James Fueg, Pebble Limited Partnership, 25 November 2020. Available online at https://pebblewatch.com/wp-content/uploads/2020/12/POA-2017-00271_Denial_LetterAppeal_Form.pdf.

2021 Dredged Material Management Office, Seattle District. Dredged Material Evaluation and Disposal Procedures User Manual. Available online at https://www.nws.usace.army.mil/Missions/Civil-Works/Dredging/User-Manual/.

2023 *Maintenance Dredging, Anchorage Harbor, Anchorage, Alaska. Environmental Assessment and Finding of No Significant Impact*. April 2023.

Vanderlaan, A.S.M., and C.T. Taggart

2007 Vessel collisions with whales: the probability of lethal injury based on vessel speed. *Marine Mammal Science* 23:144–156.

Wade, P.R.

2021 Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas. International Whaling Commission. SC/68c/IA/03.

Wartzok, D., and D.R. Ketten

1999 Marine mammal sensory systems. Pages 117-175 in J.E. Reynolds III and S.A. Rommel, eds. *Biology of Marine Mammals*. Washington, D.C.: Smithsonian Institution Press.

Wartzok, D., A.N. Popper, J. Gordon, and J. Merrill

2003 Factors affecting the responses of marine mammals to acoustic disturbance. *Marine Technology Society Journal 37*(4):6–15.

Weilgart, L.S.

2007 A brief review of known effects of noise on marine mammals. *International Journal of Comparative Psychology* 20 (2–3):159–168.

Wade, P. R., E. M. Oleson, and N. C. Young
2021 Evaluation of Hawai‘i distinct population segment of humpback whales as units under the Marine Mammal Protection Act. U.S. Dep. Commer., NOAA Tech. Memo. NMFSAFSC-430, 31 p

Weller, D.W., R. Anderson, B. Easley-Appleyard, G. Ferrara, A.R. Lang, J. Moore, P.E. Rosel, B. Taylor, and N.C. Young.
2023. Distinct population segment analysis of western North Pacific gray whales (Eschrichtius robustus) under the Endangered Species Act. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-679. https://doi.org/10.25923/7ggf-9817.

Whitehead, H.
2016. Consensus movements by groups of sperm whales. Marine Mammal Science. doi:10.1111/mms.12338

Witteveen, B.H., R.J. Foy, K.M. Wynne, and Y. Tremblay
2008 Investigation of foraging habits and prey preference of humpback whales (*Megaptera novaeangliae*) near Kodiak Island, Alaska using acoustic tags and concurrent fish surveys. *Marine Mammal Science* 24(3):516–534.

Witteveen, B.H., G.A. Worthy, K.M. Wynne, and R.J. Foy
2011 Modeling the diet of humpback whales: An approach using stable carbon and nitrogen isotope ratios in a Bayesian mixing model. *Marine Mammal Science* 28(3):233–250.

Womble, J.N., and M.F. Sigler
2006 Temporal variation in Steller sea lion diet at a seasonal haul-out in southeast Alaska. A.W. Trites, S.K. Atkinson, D.P. DeMaster, L.W. Fritz, T.S. Gelatt, L.D. Rea, and K.M. Wynne (eds.), *Sea Lions of the World*, pp. 141–154. Alaska Sea Grant College Program, Fairbanks, AK.

Womble, J.N., M.F. Sigler, and M.F. Willson
2009 Linking seasonal distribution patterns with prey availability in a central-place forager, the SSL. *Journal of Biogeography* 36(3):439–451.

Young, N. C., A. A. Brower, M. M. Muto, J. C. Freed, R. P. Angliss, N. A. Friday, P. L. Boveng, B. M. Brost, M. F. Cameron, J. L. Crance, S. P. Dahle, B. S. Fadely, M. C. Ferguson, K. T. Goetz, J. M. London, E. M. Oleson, R. R. Ream, E. L. Richmond, K. E. W. Shelden, K. L. Sweeney, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini
2023 Alaska marine mammal stock assessments, 2022. U.S. Department of Commerce, NOAA Technical Memorandum NMFSAFSC-474, 316 p.

Zerbini, A.N., K.M. Parsons, K.T. Goetz, R.P. Angliss, and N.C. Young
2022 *Identification of demographically independent populations within the currently designated Southeast Alaska harbor porpoise stock*. U.S. Department of Commerce, NOAA Technical Memo NMFS-AFS448.