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The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by DOT&PF pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated November 3, 2017 and executed by FHWA and DOT&PF.

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Appendices

- Appendix A: Project Site Plan Drawings
- Appendix B: Marine Mammal Monitoring and Mitigation Plan



Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
dB	decibels
dBA	A-weighted decibels
CFR	Code of Federal Regulations
CI	confidence interval
CWA	Clean Water Act
DOT&PF	Alaska Department of Transportation and Public Facilities
DPS	Distinct Population Segment
eDPS	eastern Distinct Population Segment
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FR	<i>Federal Register</i>
Hz	Hertz
IHA	Incidental Harassment Authorization
kHz	kilohertz
LOA	Letter of Authorization
μPa	microPascals
MMO	Marine Mammal Observer
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
Pa	Pascals
PTS	permanent threshold shift
rms	root mean square
SEL	sound exposure level
SEL _{cum}	cumulative Single Strike Equivalent
SPL	sound pressure level
SSL	sound source level
TL	transmission loss
TTS	temporary threshold shift
USACE	United States Army Corps of Engineers
USC	United States Code
wDPS	western Distinct Population Segment



1 DESCRIPTION OF SPECIFIED ACTIVITY

1.1 Introduction

The Alaska Department of Transportation and Public Facilities (DOT&PF) is proposing to modify and improve the existing dolphin structures at the Auke Bay Ferry Terminal as part of the Auke Bay Ferry Terminal Modifications and Improvements Project (Project). The in-water portion of the Project includes removal of the four existing dolphins and construction of three 4-pile breasting dolphins and two 3-pile mooring dolphins. In addition, above-water construction will include the installation of four access catwalks, modifications to the existing stern fender panels, installation of two shore anchor struts with pile foundations, and miscellaneous improvements to existing utilities (electrical and sanitary sewer).

The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) regulations governing the issuance of Incidental Harassment Authorizations (IHAs) and Letters of Authorization (LOAs) permitting the incidental take of marine mammals under certain circumstances are codified in 50 Code of Federal Regulations (CFR) Part 216, Subpart I (Sections 216.101–216.108). The Marine Mammal Protection Act (MMPA) defines “take” to mean “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal” (16 United States Code [USC] Chapter 31, Section 1362(13)). Section 216.104 sets out 14 specific items that must be addressed in requests for rulemaking and renewal of regulations pursuant to Section 101(a)(5) of the MMPA. The 14 items are addressed in Sections 1 through 14 of this application for an IHA, and include the following:

1. Description of Specified Activity
2. Dates and Duration, Specified Geographic Region
3. Species and Numbers of Marine Mammals
4. Affected Species Status and Distribution
5. Type of Incidental Take Authorization Requested
6. Take Estimates for Marine Mammals
7. Description of Potential Impacts on Marine Mammals
8. Description of Potential Impacts on Subsistence Uses
9. Description of Potential Impacts on Marine Mammal Habitat
10. Description of Potential Impacts from Loss or Modification of Habitat on Marine Mammals
11. Mitigation Measures
12. Measures to Reduce Impacts on Subsistence Users
13. Monitoring and Reporting
14. Suggested Means of Coordination

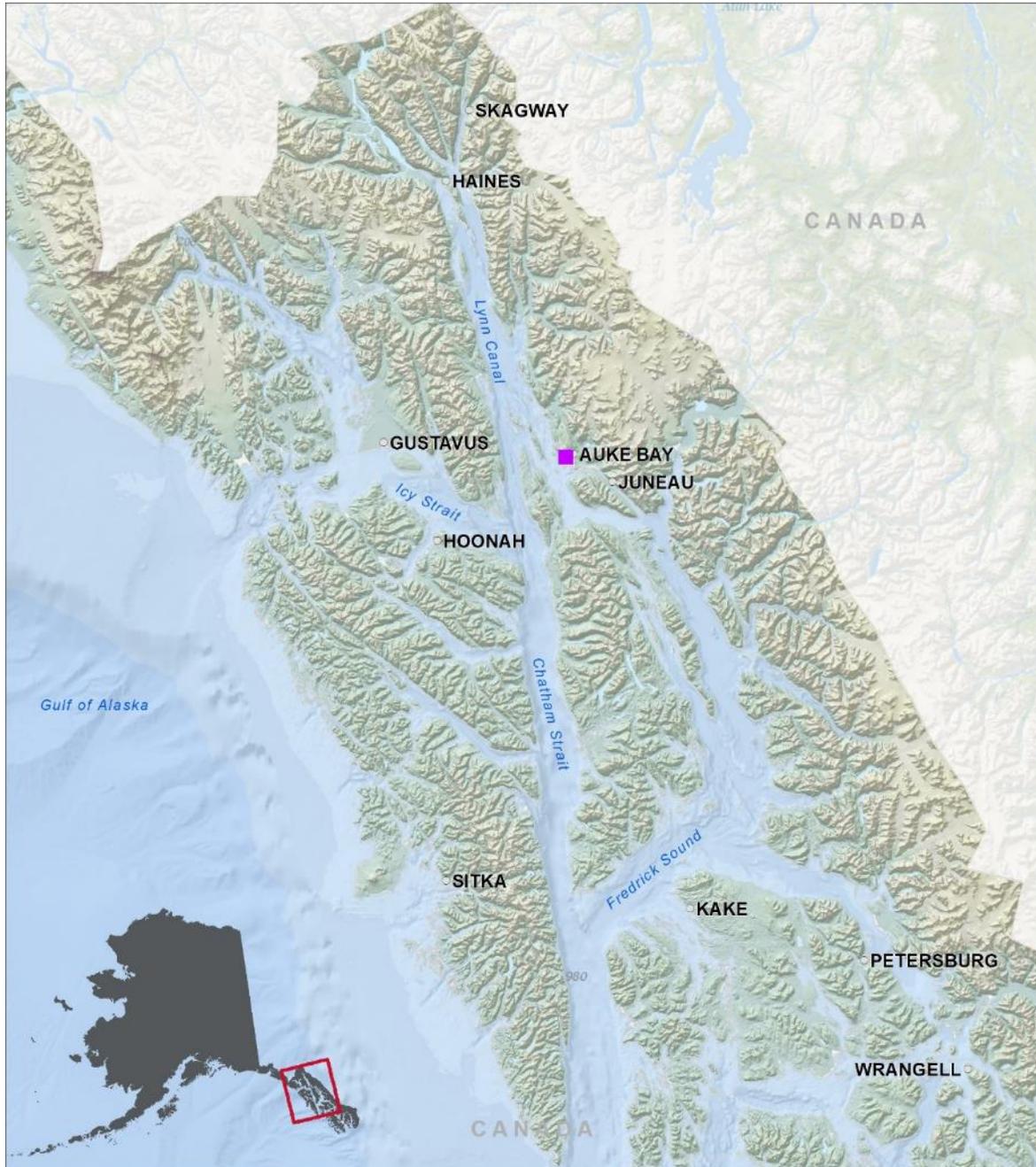
This application was prepared on behalf of the DOT&PF by HDR, Inc.



1.2 Project Purpose and Need

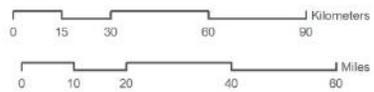
Auke Bay is located 18 kilometers (11 miles) north-northwest of Juneau, in Southeast Alaska (Figure 1-1). The Auke Bay Ferry Terminal is located along the north shore of Auke Bay (Figure 1-2) and is a major hub of the Southeast and Gulf of Alaska routes of the Alaska Marine Highway System. There are currently three Alaska Marine Highway System ferry berths in Auke Bay. The Project will involve the East Stern Berth facility, which was originally constructed in 2003 to accommodate the fast vehicle ferries. The purpose of the Project is to safely accommodate two new Alaska-class ferries, which will enter service in spring 2020. The Alaska-class ferries are equipped with vehicle ramps both fore and aft to increase efficiency for the on- and off-loading of vehicles.

The following project description and engineering plan drawings (Appendix A) are preliminary and may change as engineering and design progress. Actual numbers and sizes of piles, installation times, numbers of impact strikes, and other design and construction details and methods may vary slightly from the estimates outlined in this document. Descriptions of design and construction in this document are as accurate as possible at this stage of the Project, but may vary slightly as construction advances. It is not anticipated that the Project will change such that potential impacts to marine mammals will change from those described below. If substantial changes occur, the DOT&PF will inform NMFS of those changes.



 Project Location

Alaska Department of Transportation
 & Public Facilities
**Auke Bay Ferry Terminal
 Modifications & Improvements
 Project**



Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness. Projection is NAD 83 State Plane Zone 4 Date: 10/11/2018

Figure 1-1. Site Location and Vicinity



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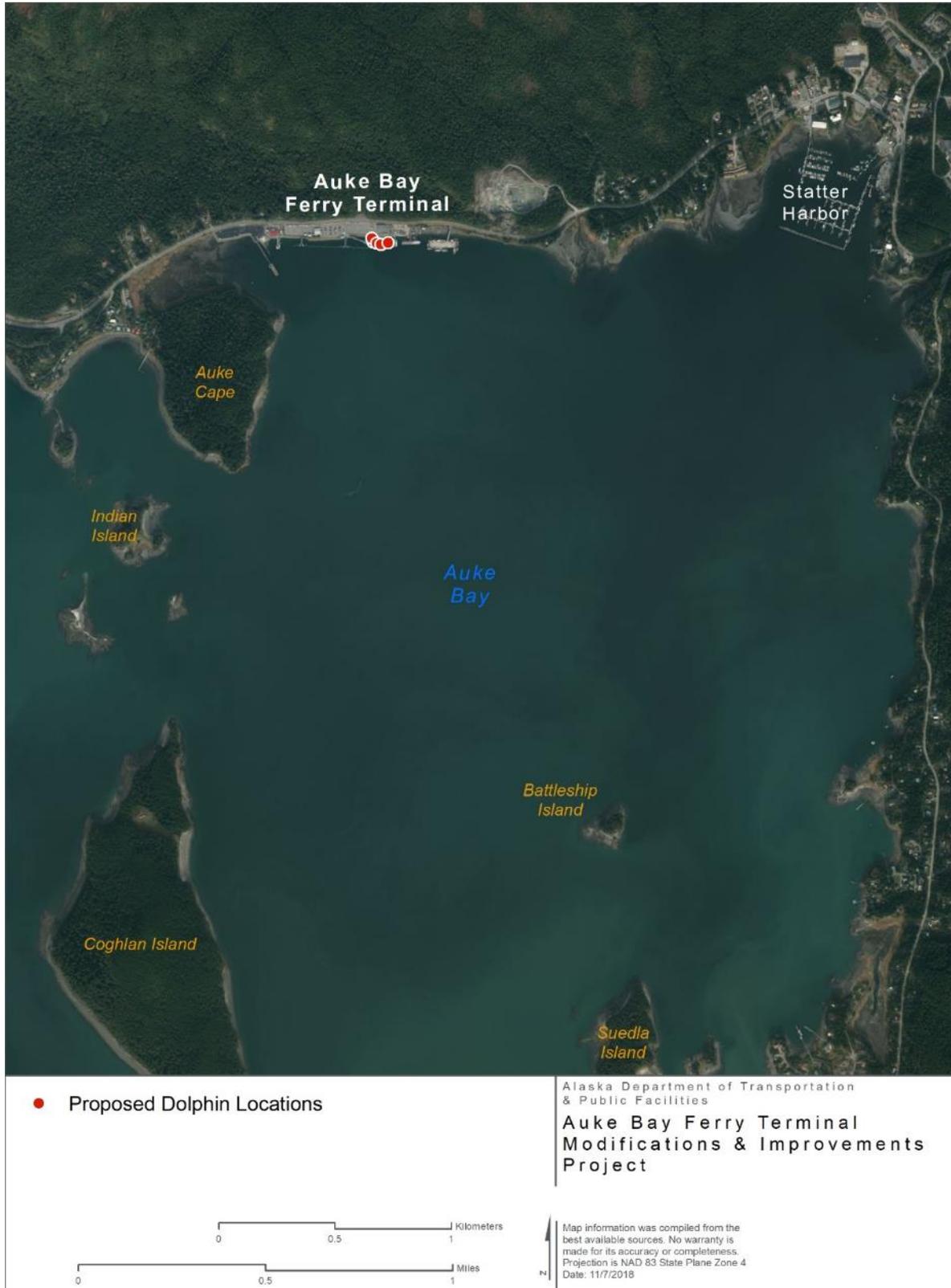


Figure 1-2. Planned Locations of Dolphin Installation and Removal in Auke Bay, Alaska

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1.3 Project Activities

Proposed activities included as part of the Project with potential to affect marine mammals include the noise generated by vibratory removal of steel pipe piles, and vibratory and impact installation of steel pipe piles. Such in-water activities could result in harassment to marine mammals as defined under the MMPA of 1972, as amended in 2007 (16 USC 31). The proposed pile installation and removal is described in detail in the following section.

In this IHA application, the units of measure reported for construction activities are U.S. customary units, which are typically used in construction. Units of measure for scientific information, including acoustics, are metric. When appropriate, units are reported as both U.S. customary and metric.

1.3.1 Project Components

The Project will involve the removal and replacement of four existing 5-pile dolphins and a single 1-pile dolphin with three 4-pile dolphins (E1, E2, and E3) and two 3-pile-dolphins (E4 and EC). A total of 21 piles will be removed and 18 piles will be installed. Construction will include impact and vibratory installation of steel pipe piles that are 24 or 30 inches in diameter, and vibratory removal of steel pipe piles that are 20, 24, or 30 inches in diameter (Table 1-1). Eight piles will be installed vertically (plumb), and 10 will be installed at an angle (battered; see Appendix A). Piles will be advanced to refusal using a vibratory hammer, and the final approximately 10 feet of driving will be conducted using an impact hammer so that the structural capacity of the pile embedment can be verified. The pile installation methods used will depend on sediment depth and conditions at each pile location. Pile installation and removal will occur in waters ranging in depth from less than 1 meter (3.3 feet) near shore up to approximately 11 meters (35 feet), depending on the structure and location. Plan drawings of all Project components are provided in Appendix A. The average estimated installation and removal rate is 1.5 steel pipe piles per day.

Above-water work will consist of the installation of two shore anchor struts above the high tide line. Additionally, there will be some improvement and retrofitting to the dock-attached stern fenders. New catwalks will be installed for pedestrian access to dolphins E1 through E4, and existing catwalks and gangways will be re-used for pedestrian access to dolphin EC (see Appendix A). Existing utilities, including electrical and sewer, will be replaced and improved. No in-water noise is anticipated in association with above-water and upland construction activities.



Table 1-1. Numbers and Types of Piles to be Installed and Removed for each Project Component

Pile Diameter and Material	Project Component	Number of Piles	Total Number of Piles	Impact Strikes Per Pile	Average Vibratory Duration Per Pile (minutes)	Estimated Total Number of Vibratory Hours	Production Rate Piles Per Day (Range)	Days of Installation or Removal
Pile Installation								
30" Steel Piles	Dolphin – E1	4	12	400	45	9	1.5 (1-3)	8
	Dolphin – E2	4						
	Dolphin – E3	4						
24" Steel Piles	Dolphin – E4	3	6	400	45	4.5	1.5 (1-3)	4
	Dolphin – EC	3						
Pile Removal								
30" Steel Piles	Dolphin – EC	1	1	N/A	30	0.5	1.5	1
24" Steel Piles	Dolphin – E1	12	12	N/A	30	6	1.5	8
	Dolphin – E2							
	Dolphin – E3							
	Dolphin – E4							
20" Steel Piles	Dolphin – E1	8	8	N/A	30	4	1.5	6
	Dolphin – E2							
	Dolphin – E3							
	Dolphin – E4							
TOTAL PILES			39					27
Total piles installed			18					12
Total piles removed			21					15

1.4 Applicable Permits/Authorizations

The following permits/authorizations are applicable to in-water work addressed by this application:

- United States Army Corps of Engineers (USACE) Section 10 of the Rivers and Harbors Act of 1899
- Section 404 of the Clean Water Act (CWA)
- Section 401 of the CWA
- NMFS Endangered Species Act (ESA) Section 7 Consultation
- Marine Mammal Protection Act
- Magnuson Stephens Act



2 DATES, DURATION, AND GEOGRAPHICAL REGION OF ACTIVITIES

2.1 Dates and Durations of Activities

Construction of the Project is scheduled to begin in November 2019 and continue through April 2020. Pile installation will be intermittent during this period, depending on weather, construction and mechanical delays, protected species shutdowns, and other potential delays and logistical constraints. Pile installation will occur intermittently during the work period, for durations of minutes to hours at a time. To account for significant Project delays, the IHA is requested for 1 year, from 01 November 2019 through 31 October 2020.

Pile installation and removal can occur at variable rates, from a few minutes to several hours per day. We anticipate that from 1 to 3 piles could be installed per day. To account for inefficiencies and delays, we estimate a mean installation/removal rate of 1.5 piles per day. Vibratory pile installation and removal will occur over 27 non-consecutive days within the 6-month construction window. Impact installation of piles will occur intermittently on 12 of those 27 days.

2.2 Geographical Setting

The project site is located within Section 21, Township 40 South, Range 65 East of the Copper River Meridian; United States Geological Survey Quad Map Juneau B-2; Latitude 58° 22' 55.7" North, 134° 41' 11.4" West; City and Borough of Juneau Tax Parcel ID 4B3001020030, Legal Description A.T.S. LT 1526; in the City and Borough of Juneau, Alaska.

2.2.1 Physical Environment

Auke Bay is an estuary at the southern end of Lynn Canal, located approximately 18 kilometers north-northwest of downtown Juneau, and roughly 130 kilometers inland from the Gulf of Alaska. The bay is one of many that lead to a larger system of glacial fjords connecting various channels with the open ocean via Lynn Canal, Icy Strait, Chatham Strait, Stephens Passage, and Frederick Sound. Auke Bay contains several small islands and reefs within the 11-square-kilometer embayment (Wing et al. 2006). While most of the bay is relatively shallow, reaching depths of 40 to 60 meters, depths of more than 100 meters have been found near Coghlan Island.

Auke Bay is generally characterized by semidiurnal tides with mean tidal ranges of more than 6 meters. Three main creeks drain into Auke Bay, including Auke Creek, Auke Nu Creek, and Waydelich Creek, as well as several smaller unnamed creeks. Auke Creek is an outlet stream from Auke Lake, located 4 kilometers to the east of the Project area. The Mendenhall River and Lemon Creek drain into Gastineau Channel and Fritz Cove to the south, eventually circulating glacier silt into Auke Bay (Sturdevant and Landingham 1993).

The bathymetry of Auke Bay is generally sloping, with occasional mounts and rises throughout. Substrate in the bay ranges in particle size, including crushed shell, pebbles, sand, and silt (Loher and Armstrong 1999). Eelgrass is occasionally found throughout the estuary, mostly in sheltered, near-shore sand or silt beaches such as within Auke Nu Cove (Harris et al. 2012). Benthic sediments in this area are already subject to disturbance and impacted by activities related to nearby harbor operations, vessel fueling, and dredging.



2.2.2 Acoustic Environment

Ongoing vessel activities throughout Auke Bay and nearby Statter Harbor, as well as land-based industrial and commercial activities, result in elevated in-air and underwater sound conditions in the Project area that likely increase with proximity to the Project site. Background sound levels likely vary seasonally, with elevated levels during summer when the tourism and fishing industries are at their peaks. Ongoing dredging activity in nearby Statter Harbor (83 FR 52394) also increases the noise levels within Auke Bay and waters adjacent to the Project area.



3 SPECIES AND ABUNDANCE OF MARINE MAMMALS

The marine waters of Southeast Alaska support many species of marine mammals, including pinnipeds and cetaceans; however, it is highly unlikely that several of these species will be observed in the Project area due to the high volume of vessel traffic in and around Auke Bay. The following seven species could occur within the Project area: Steller sea lion (*Eumetopias jubatus*), harbor seal (*Phoca vitulina*), harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), killer whale (*Orcinus orca*), humpback whale (*Megaptera novaeangliae*), and minke whale (*Balaenoptera acutorostrata*; Table 3-1). The Alaska Protected Resources Division of NMFS provides an online, interactive mapping tool to identify species protected by the MMPA based on broadly generalized species ranges (NOAA 2018). This tool identified the seven species listed above, as well as gray whales (*Eschrichtius robustus*) and fin whales (*Balaenoptera physalus*). However, it is unlikely that these species will occur in the Project area; recent NMFS IHAs for activities in Auke Bay have not included these species, and therefore they are not discussed further in this document. Each of the marine mammal species that may occur in the Project area is discussed in more detail in Section 4.

When available, peer-reviewed scientific publications are used to quantitatively estimate marine mammal abundance in the Project area. However, scientific surveys and resulting data such as population estimates, densities, and other quantitative information are lacking for most marine mammal populations and most areas of Southeast Alaska. Therefore, qualitative information was gathered from discussions with knowledgeable local people in the Auke Bay area, including biologists, the harbormaster, a tour operator, and other individuals familiar with marine mammals in the Auke Bay area. Throughout the following sections, the anecdotal reports refer to information obtained from discussions with these individuals. People who were interviewed include:

- Matthew Creswell, Deputy Harbormaster, City of Juneau
- Sunny Rice, Alaska Sea Grant Marine Advisory Program Agent, Juneau
- Kate Savage, NOAA Fisheries, Juneau
- Erin Richmond, NOAA Fisheries, Juneau
- Lauri Jemison, Marine Mammal Biologist, Alaska Department of Fish and Game (ADF&G), Juneau
- Sue Goodglick, ADF&G Marine Mammals, Anchorage

A description of each species and its presence in the Project area is provided in Section 4.



Table 3-1. Marine Mammals Known to Occur in or near the Project Area

Species	Abundance (Population/Stock)	MMPA Designation	ESA Listing	Occurrence in Project Area
Steller sea lion	41,638 (Eastern DPS)	Protected	None	Common
	54,267 (Western DPS)	Depleted & Strategic	Endangered	Rare
Harbor seal	9,478 (Lynn Canal/Stephens Passage)	Protected	None	Common
Harbor porpoise	975 (Southeast Alaska inland waters)	Strategic	None	Rare
Dall's porpoise	83,400 (Alaska)	Protected	None	Rare
Killer whale (Orca)	2,347 (Eastern North Pacific Alaska Resident)	Protected	None	Rare
	261 (Northern Resident)	Protected	None	Rare
	243 (West Coast Transient)	Protected	None	Rare
Gray whale	20,990 (Eastern North Pacific)	Protected	None	Unlikely ^a
Fin whale	2,554 (Northeast Pacific)	Depleted & Strategic	Endangered	Unlikely ^a
Humpback whale (Central North Pacific Stock)	11,398 (Hawaii DPS)	Depleted & Strategic	None	Common
	3,264 (Mexico DPS)	Depleted & Strategic	Threatened	Rare
Minke whale	Unknown (Alaska)	Protected	None	Rare

Sources: Humpback whale abundance estimates: Wade et al. 2016. Gray whale abundance estimate: Carretta et al. 2018. All other abundance estimates: Muto et al. 2018.

Note: DPS = Distinct Population Segment; ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act.

^a Excluded from further discussion in this IHA Application.



4 AFFECTED SPECIES STATUS AND DISTRIBUTION

4.1 Steller Sea Lion

4.1.1 Status and Distribution

Steller sea lions are found throughout the northern Pacific Ocean, including coastal and inland waters from Russia (Kuril Islands and the Sea of Okhotsk), east to Alaska, and south to central California (Año Nuevo Island). Steller sea lions were listed as threatened range-wide under the ESA on November 26, 1990 (55 *Federal Register* [FR] 49204). Steller sea lions were subsequently partitioned into the western and eastern Distinct Population Segments (wDPS and eDPS, respectively) in 1997 (Allen and Angliss 2010). The eDPS remained classified as threatened (62 FR 24345) until it was delisted in November 2013. The wDPS (those individuals west of 144° W longitude or Cape Suckling, Alaska) was upgraded to endangered status following separation of the stocks, and it remains listed as endangered. Steller sea lions that inhabit Southeast Alaska are overwhelmingly part of the eDPS; however, branded individuals from the wDPS have been spotted near the action area (83 FR 52394).

NMFS (2013) reports that an average of 917 individuals from the wDPS move into Southeast Alaska annually. This does not mean that they have permanently immigrated to Southeast Alaska; it is only an estimate of the number that cross the 144° W longitude boundary at least once during an average year (Fritz, L., pers. comm.). Within Southeast Alaska, abundance of wDPS individuals is higher to the north and west, and lower toward the south and east. Cape Ommaney and Frederick Sound are considered the southern limit of the range for wDPS animals. NMFS (2013) also stated that it is not currently possible to estimate the number of wDPS animals that are present east of 144° W latitude (geographic boundary of eDPS) at any particular time. However, for the purposes of this analysis, it is assumed that, of the approximately 26,000 Steller sea lions that may be present in Southeast Alaska (Allen and Angliss 2014), 917 (3.5 percent) are from the wDPS (NMFS 2013), although their estimated abundance and distribution throughout Southeast Alaska vary greatly by location (see Section 4.1.2).

The current minimum population estimate for the wDPS in Alaska is 53,303 sea lions, based on aerial and ship surveys of pups and non-pups conducted in June and July 2015 (Fritz et al. 2016a). The current minimum abundance estimate for the eDPS of Steller sea lions is 41,638 individuals (Muto et al. 2018).

The action area is not located in or near designated critical habitat for the wDPS of Steller sea lions. In Southeast Alaska, critical habitat for the wDPS of Steller sea lions includes a terrestrial zone, an aquatic zone, and an in-air zone that extends 3,000 feet (0.9 kilometer) landward, seaward, and above, respectively, any designated major rookery and major haulout. The nearest designated major haulout is located at Benjamin Island (50 CFR 226.202), 23 kilometers (12.4 nautical miles) Euclidean (i.e., straight-line) distance north-northwest of Auke Bay.

4.1.2 Presence in Project Area

Steller sea lions are common within the project area; however, systematic counts or surveys have not been completed. The species generally occurs in Auke Bay only during winter. Most individuals that frequent Auke Bay haul out at Benjamin Island in Lynn Canal. Several other haulouts are located within 20–30 kilometers of the Project area (Fritz et al. 2016b; Figure 4-1 and Figure 4-2). The most-used of these sites are Little Island and Rocky Island, with counts ranging between 0 and 805 animals between August and May from 2001 through 2004 (Fritz et

al. 2016a). The Auke Bay boating community observes Steller sea lions transiting between Auke Bay and the Benjamin Island haulout regularly during winter (83 FR 52394). Satellite tagged individuals from this haulout were observed in the vicinity of Auke Bay between November and January (Fadely 2011). Surveys of the Benjamin Island haulout have been conducted intermittently since 1982, and monthly surveys were conducted from March 2002 to May 2004. Non-pup counts conducted between October and April from 2001 to 2015 averaged 447 individuals and ranged from 49 to 803 individuals (Fritz et al. 2016a). A total of 11 ADF&G surveys were conducted at Benjamin Island between January and July 2017, with counts ranging from 0 to 768 individuals (Jemison, pers. comm. as cited in 83 FR 52394). Based on the results of 2 years of monthly surveys, Steller sea lion abundance at the Benjamin Island haulout is highest from October through April, and abundance is lowest between May and September (Figure 4-1).

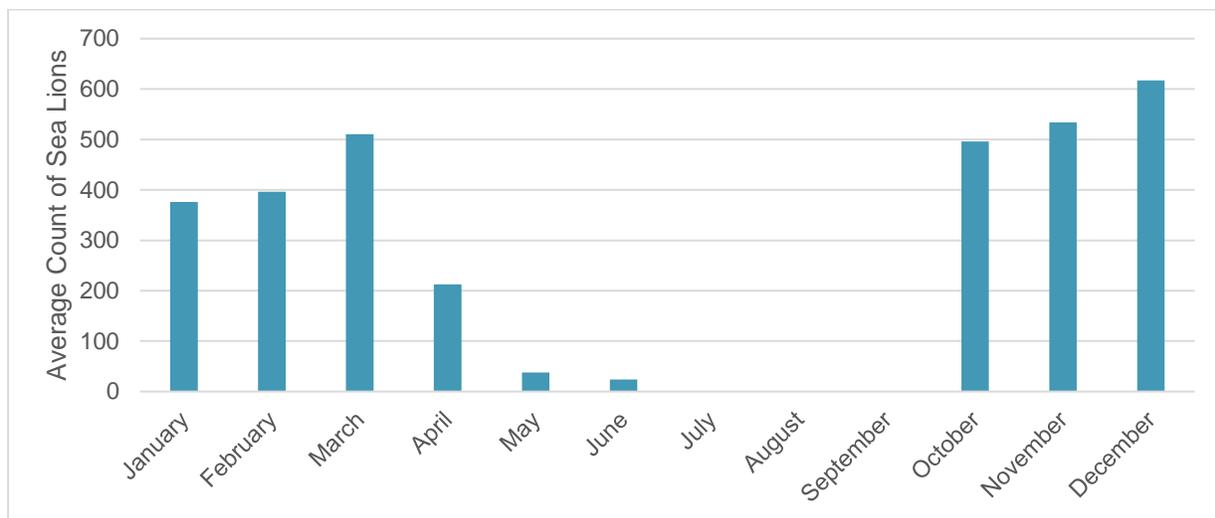


Figure 4-1. Average Monthly Abundance of Steller Sea Lions at the Benjamin Island Haulout between March 2002 and May 2004 (Source: Fritz et al. 2016a)

Steller sea lions have been observed in Auke Bay in groups as large as 121 individuals. Sea lions do not generally haul out in or near Auke Bay, but large rafts of 20–50 sea lions have been observed in Auke Bay between foraging bouts. During winter 2015-2016, Steller sea lions were observed foraging on Walleye pollock for more than 20 consecutive days. This estimate of 121 Steller sea lions per day is in agreement with incidental take numbers proposed by NMFS for a project in Statter Harbor, which is also within Auke Bay (83 FR 52394).

Members of the wDPS of Steller sea lions may occur in Auke Bay, although none have been documented. Only three branded wDPS individuals have been observed at Benjamin Island, and these observations occurred more than 10 years ago. Surveys conducted between 2007 and 2016 by ADF&G did not record any branded wDPS individuals at Benjamin Island. It is unlikely that wDPS individuals will be exposed to elevated noise levels during Project activities, but it is possible. A recent NMFS IHA for the Haines Ferry Terminal (83 FR 5063) and a proposed IHA for the Statter Harbor Improvement Project (83 FR 52394) predicted that 2 percent of Steller sea lions observed at these locations are members of the wDPS. For the purposes of this Project, the DOT&PF will adopt this conservative estimate, as discussed further in Section 4.1.1.



4.1.3 Life History

Steller sea lions are opportunistic predators, feeding primarily on a wide variety of fishes and cephalopods, including Pacific herring (*Clupea pallasii*), walleye pollock (*Gadus chalcogramma*), capelin (*Mallotus villosus*), Pacific sand lance (*Ammodytes hexapterus*), Pacific cod (*Gadus macrocephalus*), salmon (*Oncorhynchus* spp.), and squid (*Teuthida* spp.; Jefferson et al. 2008; Wynne et al. 2011). Steller sea lions do not generally eat every day, but tend to forage every 1–2 days and return to haulouts to rest between foraging trips (Merrick and Loughlin 1997; Rehberg et al. 2009).

4.1.4 Hearing Ability

Steller sea lions' hearing ability is comparable to that of other otariids. Steller sea lions use both in-air and underwater vocalizations during mating, competition for territory, and rearing of pups (Kastelein et al. 2005). Steller sea lion in-air hearing ability ranges from approximately 0.25 to 30 kilohertz (kHz); however, empirical studies have shown that the hearing of one individual was found to be most sensitive from 5 to 14.1 kHz (Muslow and Reichmuth 2010). Underwater, Steller sea lions' most sensitive hearing range has been measured from 1 to 16 kHz in males and at 25 kHz in females.



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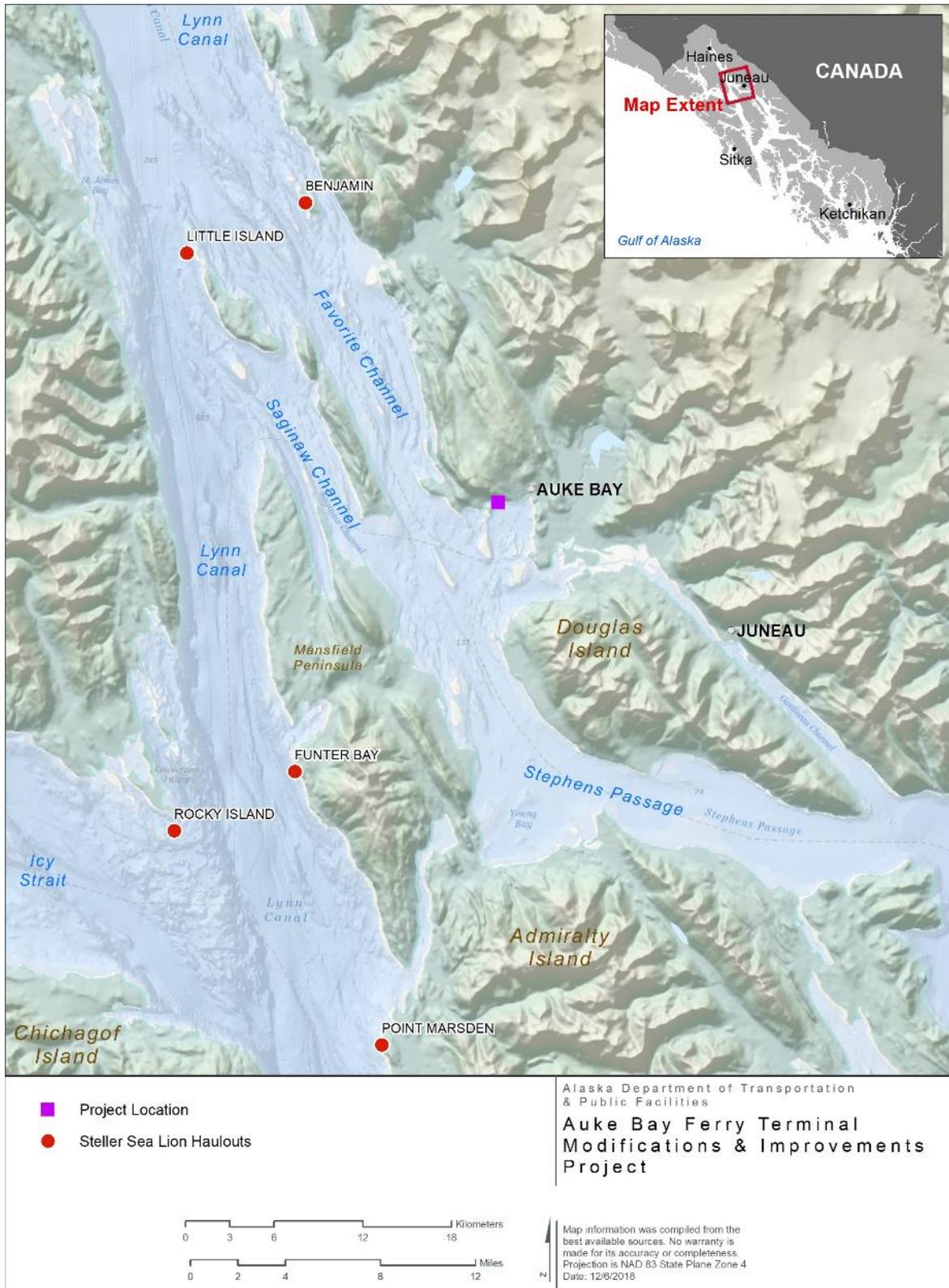


Figure 4-2. Steller Sea Lion Haulouts Located Nearest to the Project Area



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4.2 Harbor Seal

4.2.1 Status and Distribution

Harbor seals range from Baja California north along the west coasts of Washington, Oregon, California, British Columbia, and Southeast Alaska; west through the Gulf of Alaska, Prince William Sound, and the Aleutian Islands; and north in the Bering Sea to Cape Newenham and the Pribilof Islands. In 2010, harbor seals in Alaska were partitioned into 12 separate stocks based largely on genetic structure (Allen and Angliss 2010). Harbor seals are not designated as strategic or depleted under the MMPA and are not listed under the ESA, but like all other marine mammals, they are protected under the MMPA. The status of all 12 stocks of harbor seals identified in Alaska relative to their optimum sustainable population size is unknown. The current statewide abundance estimate for Alaskan harbor seals is 205,090, based on aerial survey data collected during 1998–2011.

The Lynn Canal/Stephens Passage stock is found within the Project area. The most recent population estimate for this stock is 9,478 individuals. Nine of 12 Alaska harbor seal stocks are currently increasing in number; however, evidence suggests that the Lynn Canal/Stephens Passage stock is declining (Muto et al. 2018). Only the Lynn Canal/Stephens Passage stock is considered in this application, as it is the only stock present within the project area.

4.2.2 Presence in Project Area

Harbor seals are commonly sighted in the waters of the inside passages throughout Southeast Alaska. They occur year-round within the Project area and are regularly sighted in Auke Bay, including Statter Harbor. NOAA aerial survey data indicate that groups ranging from 10 to 52 seals could be present within the Project area during summer at haulouts on the western side of Coghlan Island, as well as on Battleship Island (Richmond, E., pers. comm.). Harbor seals are known to be curious and may approach novel activity, and could enter the Project area during pile installation and removal.

4.2.3 Life History

Harbor seals forage on fish and invertebrates (Orr et al. 2004), including capelin, eulachon (*Thaleichthys pacificus*), cod, pollock, flatfish, shrimp, octopus, and squid (Wynne 2012). They are opportunistic feeders that forage in marine, estuarine, and, occasionally, freshwater habitat, adjusting their foraging behavior to take advantage of prey that are locally and seasonally abundant (Payne and Selzer 1989). Depending on prey availability, research has demonstrated that harbor seals conduct both shallow and deep dives while foraging (Tollit et al. 1997). Harbor seals usually give birth to a single pup between May and mid-July. Birthing locations are dispersed over several haulout sites and not confined to major rookeries (Klinkhart et al. 2008). Harbor seals haul out on rocks, reefs, beaches, and drifting glacial ice. They are non-migratory; their local movements are associated with tides, weather, season, food availability, and reproduction, as well as sex and age class (Boveng et al. 2012; Lowry et al. 2001; Swain et al. 1996).

4.2.4 Hearing Ability

In general, phocids have a functional hearing range between approximately 50 Hz and 86 kHz, although is most acute below 60 kHz (Møhl 1968). Harbor seals produce social calls at 0.5 to 3.5 kHz and clicks from 8 to 150 kHz (Richardson et al. 1995). Recent research by Kastelein et al. (2018) suggests that harbor seals may experience a temporary threshold shift (TTS) when



exposed to broadband pile-driving noise, but that hearing is recovered within 60 minutes post-exposure.

4.3 Harbor Porpoise

4.3.1 Status and Distribution

In the eastern North Pacific Ocean, the harbor porpoise ranges from Point Barrow, along the Alaska coast, and down the west coast of North America to Point Conception, California. In Alaska, harbor porpoises are currently divided into three stocks, based primarily on geography: the Bering Sea stock, the Southeast Alaska stock, and the Gulf of Alaska stock. The Southeast Alaska stock ranges from Cape Suckling to the Canada boundary (Muto et al. 2018). Only the Southeast Alaska stock is considered in this application because the other stocks occur outside the geographic area under consideration. Harbor porpoises frequent primarily coastal waters in Southeast Alaska (Dahlheim et al. 2009) and occur most frequently in waters less than 100 meters deep (Hobbs and Waite 2010).

Harbor porpoises are neither designated as depleted under the MMPA nor listed under the ESA, but the Southeast Alaska stock is denoted as “strategic” under the MMPA. The “strategic” designation indicates that the stock is declining, or human-caused mortality exceeds the potential biological removal level. The current minimum population estimate for harbor porpoises in the Southeast Alaska stock is 11,146 individuals, based on estimates completed in 1997 (Muto et al. 2018). No reliable information is available to determine trends in abundance.

4.3.2 Presence in Project Area

Although there have been no systematic studies or observations of harbor porpoises specific to Auke Bay, there is the potential for them to occur within the Project area. Abundance data for harbor porpoises in Southeast Alaska were collected during 18 seasonal surveys spanning 22 years, from 1991 to 2012 (Dahlheim et al. 2015). During that study, a total of 398 harbor porpoises were observed in the northern inland waters of Southeast Alaska, including Lynn Canal. The average density estimate for all survey years in Chatham Strait was 0.013 harbor porpoises per square kilometer (Dahlheim et al. 2015). For other projects in Auke Bay, NMFS has estimated that one pair of harbor porpoises per day could be present in the Project area (83 FR 52394).

Their small overall size, lack of a visible blow, low dorsal fins and overall low profile, and short surfacing time make harbor porpoises difficult to spot (Dahlheim et al. 2015), likely reducing identification and reporting of this species, and these estimates therefore may be low.

4.3.3 Life History

Harbor porpoises forage in waters less than 200 meters deep on small pelagic schooling fish such as herring, cod, pollock, octopus, smelt, and bottom-dwelling fish, occasionally feeding on squid and crustaceans (Bjørge and Tolley 2009; Wynne et al. 2011).

Calving occurs from May to August; however, this can vary by region. According to aerial surveys of harbor porpoise abundance in Southeast Alaska conducted in 1991–1993, mean group size was calculated to be 1.2 animals (Dahlheim et al. 2000).

4.3.4 Hearing Ability

Analyses of harbor porpoise echolocation clicks and buzzes have been measured at peak frequencies between 130 and 140 kHz, with a bandwidth of 6–26 kHz (Villadsgaard et al. 2007).



Similar to other toothed whales, their hearing sensitivity improves with increasing frequency and is best between 10 and 120 kHz (Au and Hastings 2008). Unlike most odontocetes, harbor porpoises do not produce whistles. Recent data suggest that harbor porpoises communicate using clicks and buzzes that, despite being in the lower end of their frequency range, are of a frequency sufficiently high so as to attenuate very rapidly, thereby not alerting predators at longer distances (Sørensen et al. 2018).

4.4 Dall's Porpoise

4.4.1 Status and Distribution

Dall's porpoises are found throughout the North Pacific, from southern Japan to southern California and north to the Bering Sea. All Dall's porpoises in Alaska are members of the Alaska stock, and those off California, Oregon, and Washington are part of a separate stock. This species can be found in offshore, inshore, and nearshore habitat, but prefers waters more than 183 meters deep (Dahlheim et al. 2009; Jefferson 2009).

Dall's porpoises, like all marine mammals, are protected under the MMPA, but this species is not listed under the ESA. Insufficient data are available to estimate current population trends, but the species is considered reasonably abundant. The current population estimate for the species is 1.2 million, and the Alaska stock was last estimated at 83,400 individuals in 1993 (Muto et al. 2018).

4.4.2 Presence in Project Area

No systematic studies of Dall's porpoise abundance or distribution have occurred in Auke Bay; however, Dall's porpoises have been consistently observed in Lynn Canal, Stephens Passage, upper Chatham Strait, Frederick Sound, and Clarence Strait (Dalheim et al. 2000). The species is generally found in waters in excess of 600 feet (183 meters) deep, which do not occur in Auke Bay. Despite generalized water depth preferences, Dall's porpoises may occur in shallower waters. Moran et al. (2018b) recently mapped Dall's porpoise distributions in bays, shallow water, and nearshore areas of Prince William Sound, habitats not typically utilized by this species. If Dall's porpoises occur in the Project area, they will likely be present in March or April, given strong seasonal patterns observed in nearby areas of Southeast Alaska (Dalheim et al. 2009). This species has a tendency to bow-ride with vessels and may occur in the Project area incidentally a few times per year.

4.4.1 Life History

Dall's porpoises generally occur in groups of 2 to 20 individuals, but have also been recorded in groups numbering in the hundreds. In Alaska, the average group size ranges from 2.7 to 3.7 individuals (Wade et al. 2003). Common prey include a variety of small, schooling fishes (such as herrings and mackerels) and cephalopods. Dall's porpoises may migrate between inshore and offshore areas and make latitudinal movements or short seasonal migrations, but these movements are generally not consistent (Jefferson 2009).

4.4.2 Hearing Ability

Similar to other porpoises, Dall's porpoises produce echolocation clicks at high frequencies, from 135 to 149 kHz, but can also produce relatively low frequency communication clicks ranging from 0.04 to 12 kHz (Richardson 1995). Dall's porpoise vocalizations have not been widely studied; however, recent research from wild porpoise recordings showed that echolocation click frequencies were centered between 117 and 141 kHz, with some as high as



198 kHz (Bassett et al. 2009). Spectral banding patterns have also been observed in this species, similar to Risso's and Pacific white-sided dolphins, which may assist with population classification for Dall's porpoise across geographic regions.

4.5 Killer Whale

4.5.1 Status and Distribution

Killer whales have been observed in all the world's oceans, but the highest densities occur in colder and more productive waters found at high latitudes (NMFS 2016a). Killer whales occur along the entire Alaska coast, in British Columbia and Washington inland waterways, and along the outer coasts of Washington, Oregon, and California (NMFS 2016a).

There are three distinct ecotypes, or forms, of killer whales recognized: Resident, Transient, and Offshore. The three ecotypes differ morphologically, ecologically, behaviorally, and genetically. Based on data regarding association patterns, acoustics, movements, and genetic differences, eight killer whale stocks are now recognized within the Pacific U.S. Exclusive Economic Zone. This application considers only the Eastern North Pacific Alaska Resident stock (Alaska Resident stock), Eastern North Pacific Northern Resident stock (Northern Resident stock), and West Coast Transient stock, because all other stocks occur outside the geographic area under consideration (Muto et al. 2018). None of these three stocks of killer whales is designated as depleted or strategic under the MMPA, or listed as threatened or endangered under the ESA.

The Alaska Resident stock occurs from Southeast Alaska to the Aleutian Islands and Bering Sea. Photo-identification studies between 2005 and 2009 identified 2,347 individuals in this stock, including approximately 121 in Southeast Alaska (Muto et al. 2018). The Northern Resident stock occurs from Washington north through part of Southeast Alaska, and consists of 261 individuals. The West Coast Transient stock occurs from California north through Southeast Alaska. Between 1975 and 2012, surveys identified 521 individual West Coast Transient killer whales. In the most recent stock assessment (Muto et al. 2018), the minimum population for the transient stock is estimated to be 243 individuals. Dahlheim et al. (2009) noted a 5.2 percent annual decline in transient killer whales observed in Southeast Alaska between 1991 and 2007.

Surveys between 1991 and 2007 encountered resident killer whales during all seasons throughout Southeast Alaska. Both residents and transients were common in a variety of habitats and all major waterways, including protected bays and inlets. There does not appear to be strong seasonal variation in abundance or distribution of killer whales, but there was substantial variability between years during this study (Dahlheim et al. 2009).

4.5.2 Presence in Project Area

No systematic studies of killer whales have been conducted in or around Auke Bay. Killer whales were observed infrequently (on 11 of 135 days) during monitoring in Hoonah, and most were recorded in deeper, offshore waters (Berger ABAM 2016). Dalheim et al. (2009) observed transient killer whales within Lynn Canal, Icy Strait, Stephens Passage, Frederick Sound and upper Chatham Strait. Transient killer whales tend to transit through Lynn Canal and occasionally enter Auke Bay to target local harbor seal, harbor porpoise, or Steller sea lion populations, but do not linger in the Project area (Savage, K., pers. comm.).

4.5.3 Life History

Transient killer whales hunt and feed primarily on marine mammals, while residents forage primarily on fish. Transient killer whales feed primarily on harbor seals, Dall's porpoises, harbor



porpoises, and sea lions. Resident killer whale populations in the eastern North Pacific feed mainly on salmonids, showing a strong preference for Chinook salmon (NMFS 2016a).

Transient killer whales are often found in long-term stable social units (pods) of 1 to 16 whales. Average pod sizes in Southeast Alaska were 6 in spring, 5 in summer, and 4 in fall. Pod sizes of transient whales are generally smaller than those of resident social groups. Resident killer whales occur in pods ranging from 7 to 70 whales that are seen in association with one another more than 50 percent of the time (Dahlheim et al. 2009; NMFS 2016b). In Southeast Alaska, resident killer whale mean pod size was approximately 21.5 in spring, 32.3 in summer, and 19.3 in fall (Dahlheim et al. 2009).

4.5.4 Hearing Ability

Killer whales are categorized as mid-frequency hearing cetaceans, although they hear best at the higher end of that spectrum between 80 and 120 kHz (Richardson et al. 1995). The ability to hear most acutely in this frequency range is related to their use of high-frequency sound for echolocation. Killer whale vocalizations include clicks and whistles, but are most often high-energy rapid pulsed sounds in the 500-Hz to 25-kHz range, with pulse duration varying between echolocation clicks and other pulsed calls (Ford and Fisher 1982). North Pacific killer whales are known to produce whistles from 1 to 18 kHz (Thomsen et al. 2001).

4.6 Humpback Whale

4.6.1 Status and Distribution

Humpback whales experienced large population declines in the early twentieth century due to commercial whaling operations. Johnson and Wolman (1984) estimated the population of humpback whales at approximately 1,200 animals in 1966. The North Pacific population grew to between 6,000 and 8,000 individuals by the mid-1990s.

The population of the Hawaii DPS is currently estimated at 11,398 individuals (95% confidence interval [CI] = 10,503–12,370), and the Mexico DPS is estimated at 3,264 individuals (95% CI = 2,912–3,659). The population of humpback whales from both the Hawaii and Mexico DPSs that are found in the summer feeding grounds of Southeast Alaska is approximately 6,137 individuals (95% CI = 5,352–7,038; Wade et al. 2016). Current threats to humpback whales include vessel strikes, spills, climate change, and commercial fishing operations (Muto et al. 2018). Humpback whales worldwide were designated as "endangered" under the Endangered Species Conservation Act in 1970, and had been listed as a species under the ESA since its inception in 1973. On 8 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 (4 endangered and 1 threatened), while the other 9 DPSs were delisted.

Humpback whales found in the project area are predominantly members of the Hawaii DPS, which is not listed under the ESA. However, based on a comprehensive photo-identification study, members of the Mexico DPS, which is listed as threatened, are known to occur in Southeast Alaska. Members of different DPSs are known to intermix on feeding grounds; therefore, all waters off the coast of Alaska should be considered to have ESA-listed humpback whales. Approximately 6.1 percent (or fewer than 1 in every 16) of all humpback whales in Southeast Alaska and northern British Columbia are members of the Mexico DPS, while all others are assumed to be members of the Hawaii DPS (Wade et al. 2016).



Humpback whales are found throughout Southeast Alaska in a variety of marine environments, including open-ocean, nearshore waters, and areas with strong tidal currents (Dahlheim et al. 2009). Most humpback whales are migratory and spend winters in the breeding grounds off either Hawaii or Mexico. Humpback whales generally arrive in Southeast Alaska in March and return to their wintering grounds in November. Some humpback whales depart late or arrive early to feeding grounds, and therefore the species occurs in Southeast Alaska year-round (Straley 1990). Across the region, there have been no recent estimates of humpback whale density.

4.6.2 Presence in Project Area

Humpback whales migrate to Southeast Alaska in spring to feed after months of fasting in equatorial breeding grounds such as Hawaii and Mexico. Peak abundance of humpback whales in Southeast Alaska typically occurs during late summer to early fall. Most humpback whales begin returning to southern breeding grounds in fall or winter. However, due to temporal overlap between whales departing and returning, humpbacks can be found in Alaska feeding grounds in every month of the year (Baker et al. 1985; Straley 1990; Wynne and Witteveen 2009). It is also common for some humpback whales to overwinter in areas of Southeast Alaska, such as Tenakee Springs (83 FR 29749) and Lynn Canal (83 FR 52394). It is thought that those humpbacks that remain in Southeast Alaska do so in response to the availability of winter schools of fish prey, such as herring (Straley 1990).

Humpback whales' utilization of Auke Bay is intermittent and irregular year-round. Recent anecdotal accounts by the Juneau Deputy Harbormaster indicate that humpback whale abundance in Auke Bay has been lower over the last 18 months than in past years (Creswell, M., pers. comm.). Specific micro-habitat features of Auke Bay attract forage fish, specifically herring, and are frequented by humpback whales (83 FR 52394). Although abundance is generally higher in the summer, the presence of prey fish is a greater determinant of the presence of humpback whales. Teerlink (2017) identified 179 individual humpback whales in the Juneau area based on fluke identification. Between Juneau and Glacier Bay, 189 unique individuals were identified by Krieger and Wing (1986). During winter, researchers have documented 1 to 19 individual humpback whales per month in waters close to the Project area, including Lynn Canal (Moran et al. 2018a; Straley et al. 2018).

4.6.3 Life History

Southeast Alaska is considered a biologically important area for feeding humpback whales between March and May (Ellison et al. 2012). Most humpback whales migrate to other regions during winter to breed, but over-wintering (non-breeding) humpback whales have been noted and may be increasingly common (Straley 1990; Lewis, S., pers. comm.). In Alaska, humpback whales filter feed on tiny crustaceans, plankton, and small fish such as walleye pollock, Pacific sand lance, herring (*Clupea pallasii*), eulachon (*Thaleichthys pacificus*), and capelin (Witteveen et al. 2012). It is common to observe groups of humpback whales cooperatively bubble feeding. Group sizes in Southeast Alaska generally range from one to four individuals (Dahlheim et al. 2009).

4.6.4 Hearing Ability

Humpbacks are classified in the low-frequency cetacean functional hearing group, able to perceive frequencies between 7 Hz and 35 kHz (Richardson et al. 1995). Humpback whales create several types of vocalizations ranging from 20 Hz to 10 kHz in order to forage for prey, organize collaborative feeding efforts, facilitate mother-calf communication, and select and attract potential mates (Winn et al. 1970; Au et al. 2006; Vu et al. 2012). Anthropogenic noise



has the potential to result in social disturbance, physical discomfort or trauma, and masking of communication with conspecifics. Underwater activities, such as pile driving, vessel traffic, and seismic surveys, may cause humpbacks to modify their acoustic behavior in the more complex sound-scape (Fleming and Jackson 2011; Blair et al. 2016; Dunlop et al. 2016; Fournet et al. 2018).

4.7 Minke Whale

4.7.1 Status and Distribution

Minke whales, like all other marine mammals, are protected under the MMPA, but are not listed under the ESA. The population status of minke whales is considered stable throughout most of their range. Historically, commercial whaling reduced the population size of this species, but given their small size, they were never a primary target of whaling and did not experience the severe population declines that larger cetaceans did. Minke whales are found throughout the northern hemisphere in polar, temperate, and tropical waters (Jefferson et al. 2008).

The International Whaling Commission has identified three minke whale stocks in the North Pacific: one near the Sea of Japan, a second in the rest of the western Pacific (west of 180°W), and a third, less concentrated, stock throughout the eastern Pacific. NOAA further splits this third stock between Alaska whales and resident whales of California, Oregon, and Washington (Muto et al. 2018). Minke whales are found in all Alaska waters though there are no population estimates for minke whales in Southeast Alaska. Surveys in Southeast Alaska have consistently identified individuals throughout inland waters in low numbers (Dahlheim et al. 2009).

4.7.2 Presence in Project Area

Minke whales in Southeast Alaska are part of the Alaska stock (Muto et al. 2018). Dedicated surveys for cetaceans in Southeast Alaska found that minke whales were scattered throughout inland waters from Glacier Bay and Icy Strait to Clarence Strait, with small concentrations near the entrance of Glacier Bay (Dahlheim et al. 2009). All sightings were of single minke whales, except for a single sighting of multiple minke whales. Surveys took place in spring, summer, and fall, and minke whales were present in low numbers in all seasons and years. No information appears to be available on the winter occurrence of minke whales in Southeast Alaska. Anecdotal observations suggest that minke whales do not enter Auke Bay, and so are expected to rarely occur in the Project area.

4.7.3 Life History

In Alaska, the minke whale diet consists primarily of euphausiids and walleye pollock. Minke whales are generally found in shallow, coastal waters within 200 meters of shore (Zerbini et al. 2006) and are almost always solitary or in small groups of 2 to 3. Rarely, loose aggregations of up to 400 animals have been associated with feeding areas in arctic latitudes.

4.7.4 Hearing Ability

Similar to other baleen whales, minke whale hearing is optimized in the low frequencies, ranging from 7 Hz to 35 kHz. Recent research by Yamato et al. (2012) exploring minke whale auditory physiology has shown that minke whales may be able to hear more acutely at higher frequencies than previously thought, perhaps as a defense mechanism to hear predatory killer whale vocalizations.



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5 TYPE OF INCIDENTAL TAKE AUTHORIZATION REQUESTED

5.1 Incidental Harassment Authorization

Under Section 101(a)(5)(D) of the MMPA, the DOT&PF requests an IHA for the take of small numbers of marine mammals, incidental to installation and removal of steel piles associated with the Auke Bay Ferry Terminal Modifications and Improvement Project in Auke Bay, Alaska. The IHA is requested for 01 November 2019 to 31 October 2020. The DOT&PF is not requesting an LOA at this time because the Project will not occur for more than 1 calendar year, and the impacts described herein are not expected to rise to the level of serious injury or mortality, which would require an LOA.

5.2 Take Authorization Request

The DOT&PF requests the issuance of an IHA for Level B take (behavioral harassment) of small numbers of Steller sea lions, harbor seals, harbor porpoises, Dall's porpoises, killer whales, humpback whales, and minke whales that may occur incidentally during the Project. In addition, the DOT&PF requests small numbers of Level A take (potential injury) of harbor seals and harbor porpoises that may occur incidentally during the Project. Level A take is not anticipated, and shutdown protocols are intended to prevent exposure to such noise levels. However, Level A take is requested to ensure compliance in the unlikely event that a harbor seal or harbor porpoise enters a Level A harassment zone undetected. Several of the species for which take is requested are uncommon in the Project area. The request for a small number of takes for each species that is rarely or occasionally observed in the Project area reduces the risk of the Project being shut down if one of these species enters the Level B harassment zone during pile installation or removal. It is unlikely, however, that take of these species will occur.

The methodology described in Section 6 estimates potential noise exposures of marine mammals resulting from pile installation and removal in the marine environment. Potential exposures tend to be overestimated because all animals are assumed to be available to exposure while piles are being installed and removed, and the formulas used to estimate transmission loss use idealized parameters. Additionally, this approach assumes that all exposed individuals are "taken," contributing to an overestimation of "take."

The analysis for the Project predicts 4,686 potential exposures to Level B harassment and predicts 144 potential exposures to Level A harassment (4,830 total exposures) during Project activities. DOT&PF mitigation measures for the Project (Section 11) include monitoring of Level B and Level A harassment zones prior to the initiation of pile installation and removal, and "soft starts" or ramp-up procedures designed to allow marine mammals to leave the Project area before noise levels reach the threshold for harassment. In addition, "shutdown zones" have been established for pile installation and removal to avoid injury to marine mammals. These mitigation measures decrease the likelihood that marine mammals will be exposed to sound pressure levels that will cause harassment or harm, although the amount of that decrease cannot be quantified.

The DOT&PF does not expect that all potential exposures to Level B and Level A harassment will result from Project activities. However, to allow for uncertainty regarding the exact mechanisms of the physical and behavioral effects, and as a conservative approach, the DOT&PF is requesting authorization for incidental harassment of 4,830 marine mammals during



Project activities. As described in Section 6.6, most takes are expected to result from repeated exposures of a small number of individuals.

5.3 Method of Incidental Taking

Pile installation and removal activities as outlined in Section 1 have the potential to disturb or displace small numbers of marine mammals. Specifically, the proposed activities may result in take in the form of Level B harassment from underwater sounds generated from vibratory and impact pile installation, and vibratory pile removal. In addition, harbor seals and harbor porpoises may be incidentally exposed to Project-related underwater noise levels that exceed species-specific thresholds for Level A harassment. Section 11 provides details on the impact minimization and reduction measures proposed.

Detectable effects of the Project on marine mammal habitat will be minor (Section 9). Indirect effects to prey will be insignificant and discountable due to recolonization and the temporary nature of the activity, and are expected to be undetectable. The Project is not expected to lead to any increases in marine vessel traffic in the region; therefore, ship strikes were not evaluated.



6 TAKE ESTIMATES FOR MARINE MAMMALS

The NMFS application for IHAs requires applicants to determine the number and species of marine mammals that are expected to be incidentally harassed by an action and the nature of the harassment (Level A or Level B). Project construction activities as outlined earlier have the potential to take marine mammals during pile installation and removal. Other activities are not expected to result in “take” as defined under the MMPA. In-water pile installation and removal will temporarily increase the local underwater and airborne noise environment in the Project area. Research suggests that increased noise may impact marine mammals in several ways and that the likelihood of impacts depends on many factors (Section 7).

6.1 In-Air and Underwater Sound Descriptors

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium such as air or water. Sound is generally characterized by several variables, including frequency and intensity. Frequency describes the sound’s pitch and is measured in Hertz (Hz), while intensity describes the sound’s loudness and is measured in decibels (dB). Decibels are measured using a logarithmic scale.

The method commonly used to quantify airborne sounds consists of evaluating all frequencies of a sound according to a weighting system, reflecting the fact that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This is called A-weighting, and the decibel level measured is called the A-weighted sound level (dBA). A filtering method to reflect the hearing of marine mammals such as whales has not been developed for regulatory purposes; therefore, sound levels underwater are not weighted and measure the entire frequency range of interest. In the case of marine construction work, the frequency range of interest is 10 to 10,000 Hz.

Underwater sounds are described by a number of terms that are commonly used and specific to this field of study (Table 6-1). Two common descriptors are the instantaneous peak sound pressure level (SPL) and the root-mean-square SPL (dB rms) during the pulse or over a defined averaging period. The peak sound pressure is the instantaneous maximum or minimum overpressure observed during each pulse or sound event and is presented in Pascals (Pa) or dB referenced to a pressure of 1 microPascal (dB re 1 μ Pa). The rms level is the square root of the energy divided by a defined time period. All in-water sound levels throughout this report are presented in dB re 1 μ Pa rms unless otherwise specified.

Transmission loss is the accumulated decrease in acoustic intensity as an acoustic pressure wave propagates outward from a source such as a pile during installation. The intensity of the sound at its source is reduced because it spreads as it moves away from the source. Cylindrical spreading occurs when sound energy spreads outward in a cylindrical fashion, bounded by the bottom sediment and water surface, such as in shallow water, resulting in a 3-dB reduction per doubling of distance. Spherical spreading occurs when the source encounters little to no refraction or reflection from boundaries (e.g., bottom or surface), such as in deep water, resulting in a 6-dB reduction per doubling of distance.



Table 6-1. Definitions of Some Common Acoustical Terms

Term	Definition
Decibel, dB	A decibel is a unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for water is 1 microPascal (μPa) and for air is 20 μPa (approximate threshold of human audibility).
Sound Pressure Level, SPL	Sound pressure is the force per unit area, usually expressed in microPascals (or 20 microNewtons per square meter [m^2]), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 m^2 . The SPL is expressed in decibels as 20 times the logarithm to the base 10 of the ratio of the pressure exerted by the sound to a reference sound pressure. SPL is the quantity that is directly measured by a sound level meter.
Frequency, Hz	Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as Hertz (Hz). Typical human hearing ranges from 20 to 20,000 Hz.
Peak Sound Pressure (unweighted), dB re 1 μPa	Peak sound pressure level is based on the largest absolute value of the instantaneous sound pressure over the frequency range from 20 to 20,000 Hz. This pressure is expressed in this report as dB re 1 μPa .
Root-Mean-Square (rms), dB re 1 μPa	The rms level is the square root of the energy divided by a defined time period. For pulses, the rms has been defined as the average of the squared pressures over the time that comprises that portion of waveform containing 90 percent of the sound energy for one impact pile installation impulse.
Ambient Noise Level	The ambient noise level is the background sound level, which is a composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Transmission Loss, TL	TL underwater is the accumulated decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water chemistry, water depth, bottom composition and topography, and underwater objects in the area.

6.2 Applicable Noise Criteria

NMFS published updated *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing* (Technical Guidance) in April 2018 that identifies the received levels, or thresholds, above which individual marine mammals are predicted to experience changes in their hearing sensitivity (either temporary or permanent) for underwater anthropogenic noise sources (i.e., Level A harassment; NMFS 2018). The 2018 guidance contains the same criteria included in the 2016 guidance (NMFS 2016b). To assess Level B harassment levels, NMFS continues to use its interim criteria.

Level A harassment is defined as “any act of pursuit, torment, or annoyance which has the potential to *injure* a marine mammal or marine mammal stock in the wild.” Level B harassment is defined as “any act of pursuit, torment, or annoyance which 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, but which *does not* have the potential to injure a marine mammal or marine mammal stock in the wild.”

6.2.1 Level A Harassment

For underwater noise exposure, this IHA application uses the Technical Guidance (revised 2018). Received levels, or thresholds, above which individual marine mammals are predicted to experience permanent changes in their hearing sensitivity (or a permanent threshold shift [PTS]) due to underwater anthropogenic sound sources have also been weighted by functional hearing groups as defined in the Technical Guidance (Table 6-2; NMFS 2018). Under the Technical Guidance, these levels are considered thresholds for Level A (injury) harassment. Calculation of Level A harassment isopleth distances based on PTS onset acoustic thresholds requires information on characteristics of the sound and the local environment.

Table 6-2. Summary of Permanent Threshold Shift Onset Acoustic Thresholds for Assessing Level A Harassment of Marine Mammals from Exposure to Noise from Continuous and Pulsed Underwater Sound Sources

Functional Hearing Group Frequency Range Species Groups	Impulsive (Impact Hammer)	Non-Impulsive (Vibratory Hammer)
Low-Frequency (LF) Cetaceans 7 Hz to 35 kHz Humpback whales, minke whales, other baleen whales	$L_{pk,flat}$: 219 dB $L_{E, LF, 24h}$: 183 dB	$L_{E, LF, 24h}$: 199 dB
Mid-Frequency (MF) Cetaceans 150 Hz to 160 kHz Dolphins, beluga whales, killer whales, beaked whales	$L_{pk,flat}$: 230 dB $L_{E, MF, 24h}$: 185 dB	$L_{E, MF, 24h}$: 198 dB
High-Frequency (HF) Cetaceans 275 Hz to 160 kHz Dall’s porpoises, harbor porpoises, Pacific white-sided dolphins	$L_{pk,flat}$: 202 dB $L_{E, HF, 24h}$: 155 dB	$L_{E, HF, 24h}$: 173 dB
Phocid Pinnipeds (PW) Underwater 50 Hz to 86 kHz Harbor seals, other true seals	$L_{pk,flat}$: 218 dB $L_{E, PW, 24h}$: 185 dB	$L_{E, PW, 24h}$: 201 dB
Otariid Pinnipeds (OW) Underwater 60 Hz to 39 kHz Sea lions, fur seals	$L_{pk,flat}$: 232 dB $L_{E, OW, 24h}$: 203 dB	$L_{E, OW, 24h}$: 219 dB

$L_{pk,flat}$ = Peak sound pressure level (unweighted); $L_{E,24h}$ = Sound exposure level, cumulative 24 hours; Hz = Hertz; kHz = kilohertz

Source: NMFS 2018.

6.2.2 Level B Harassment

To assess Level B harassment levels, this document uses the NMFS interim criteria for exposure of marine mammals to various underwater sound sources. For impulsive noise (e.g., impact pile installation), the Level B harassment threshold is set at an SPL value of 160 dB re 1 μ Pa rms. For non-pulsed and continuous noise (e.g., vibratory pile installation), the Level B harassment threshold is set at an SPL of 120 dB re 1 μ Pa rms.

For airborne noise exposure of hauled-out pinnipeds, NMFS uses criteria for Level B harassment of 90 dB re 20 μ Pa for harbor seals and 100 dB re 20 μ Pa for all other pinnipeds, including Steller sea lions. These criteria do not differentiate among noise types.



6.3 Description of Noise Sources

The Project will increase the existing in-air and underwater acoustic levels of Auke Bay, which is part of a high-use industrial area with frequent marine vessel traffic and associated activities. The soundscape in the vicinity of the Project includes existing ambient sound, plus construction noise from the Project. The primary component of the Project that may affect marine mammals is the noise generated by vibratory removal of steel pipe piles and vibratory and impact installation of steel pipe piles. Refer to Section 1.3 for a description of these pile installation and removal techniques. Other activities associated with the Project (e.g., upland and above-water construction activities, vessel activities) do not produce in-air or underwater noise levels expected to exceed Level A or Level B harassment levels for any marine mammal hearing group.

6.3.1 Ambient Sound

Ambient (or background) sound is composed of sound from many sources and from multiple locations (Richardson et al. 1995). In general, ambient sound levels in the marine environment are variable over time due to a number of biological, physical, and anthropogenic (e.g., man-made) sources. Ambient noise can vary with location, time of day, tide, weather, season, and frequency on scales ranging from a second to a year. Underwater sound types in the Project area include physical noise, biological noise, and anthropogenic noise. Physical noise includes noise from waves at the water surface, rain, and currents; moving rocks, sediment, and silt; and atmospheric noise. Biological sound includes vocalizations and other sounds produced by marine mammals, fishes, seabirds, and invertebrates. Anthropogenic noise includes noise from vessels (small and large), shore-based processing plants, marine fueling facilities, ferry and barge cargo loading/unloading operations, maintenance dredging, aircraft overflights, construction noise, and other sources, which produce varying noise levels and frequency ranges (Table 6-3).

Table 6-3. Representative Noise Levels of Anthropogenic Sources of Noise Commonly Encountered in Marine Environments

Noise Source	Frequency Range (Hz)	Underwater Noise Level (dB rms re 1 μ Pa)	Reference
Small vessels	250–1,000	151 dB at 1 meter	Richardson et al. (1995)
Tug docking gravel barge	200–1,000	149 dB at 100 meters	Blackwell and Greene (2002)
Container/cruise ship	100–500	180 dB at 1 meter	Richardson et al. (1995)
Dredging operations	50–3,000	120–140 dB at 500 meters; 156.9 dB at 30 meters	URS (2007); SFS (2009)

Note: dB = decibels; rms re 1 μ Pa = root mean square referenced to 1 microPascal

Ongoing vessel activities throughout Auke Bay, as well as land-based industrial and commercial activities, result in elevated in-air and underwater sound conditions in the Project area that increase with proximity to the Project site. Sound levels likely vary seasonally, with elevated levels during summer, when the tourism and fishing industries are at their peaks. The 120 dB rms ambient sound level is used by NMFS as the default for regulatory purposes, including incidental take estimation under the MMPA, and will be used for this Project.



6.3.2 Underwater Noise Levels

Pile Installation/Removal Noise Levels

The Project includes vibratory and impact pile installation of steel pipe piles and vibratory removal of steel pipe piles. Sound source levels (SSLs) for each type of activity were estimated using empirical measurements from similar projects in Auke Bay, elsewhere in Alaska, or outside of Alaska (Table 6-4).

Table 6-4. Estimates of Underwater Sound Source Levels Generated during Vibratory and Impact Pile Installation, and Vibratory Pile Removal

Method and Pile Type	Sound Source Level at 10 meters			Literature Source
Vibratory Hammer	dB rms			
30-inch steel piles	168			Denes et al. 2016 (Table 72)
24-inch steel piles	161			Navy 2015
20-inch steel piles ^a	161			Navy 2015
Impact Hammer	dB rms	dB SEL	dB peak	
30-inch steel piles	191	177	206	Denes et al. 2016 (Table 72)
24-inch steel piles	190	177	203	Caltrans 2015

Note: It is assumed that noise levels during pile installation and removal are similar. dB = decibels; rms = root mean square; SEL = sound exposure level; Caltrans = California Department of Transportation.

^a SSL data for 20-inch piles are not available. SSLs for 20-inch piles are conservatively assumed to be the same as 24-inch piles.

6.3.3 In-Air Noise Levels

The Washington State Department of Transportation recorded airborne noise levels from impact installation of 30-inch piles in December 2015 at the Vashon Ferry Terminal near Seattle, Washington (WSDOT 2018). In-air noise levels during impact installation were 110 dBA as measured at 50 feet (15.24 meters). This value was chosen as the estimate for impact installation of 30-inch-diameter steel piles for the Project. A sound study conducted in Statter Harbor in 2008 (PND 2011) found that ambient in-air sound levels generally ranged from 50 to 70 dBA in that area. Based on this study, ambient in-air noise was assumed to average 60 dBA at the Auke Bay Ferry Terminal during daylight hours. To determine the distance in-air construction noise will travel before it attenuates to the ambient sound level, the following equation is used:

$$D = D_0 * 10^{((Construction\ Noise - Ambient\ Sound\ Level)/\alpha)}$$

where D is the distance from the noise source, D₀ is the reference measurement distance (15 meters in this case), and α is the transmission loss per doubling of distance (estimated at 20 dBA for hard-site conditions [over water] and 25 dBA for soft-site conditions [forested or urbanized terrain]). For this analysis, hard-site conditions were assumed above the surface of the ocean, and soft-site conditions were assumed over land, which results in the maximum possible distance that noise from pile installation could be discernable above ambient levels. Based on this model, in-air noise from impact installation of 30-inch piles could extend up to 4.8 kilometers (3.0 miles) from the noise source over open water until it is no longer discernable above estimated ambient sound levels. Over land, the maximum distance that in-air noise will be discernable above ambient is 1,524 meters (5,000 feet) due to absorption and scattering from vegetation, buildings, and other surfaces. A viewshed analysis was conducted using a



geographic information system to approximate the distance that in-air noise could travel before it would be impeded by local topography, which reduced the in-air action area in some directions.

6.4 Distances to Sound Thresholds

6.4.1 Underwater Noise

Vibratory and impact pile installation will generate underwater noise that could disturb marine mammals in the Project area. Ambient underwater sound levels were assumed to be 120 dB rms for this evaluation (Section 6.3.1). The SSLs for pile installation were estimated by using the results of measurements from the best available and most relevant sound source verification studies (Table 6-4).

The attenuation of underwater noise (transmission loss [TL]) is estimated using the practical spreading loss model. The formula for transmission loss is:

$$TL = X \log_{10} (R/D)$$

where R is the distance from the source, D is the distance of the known or measured noise level, and X is the TL coefficient. NMFS typically recommends a TL coefficient of 15 dB per tenfold increase in distance when site-specific empirical data are unavailable. Denes et al. (2016) estimated the TL coefficient for vibratory (16.4) and impact (14.6) installation of 30-inch diameter piles. Site-specific data for 20- and 24-inch piles are unavailable; therefore, this document uses the site-specific TL coefficients for 30-inch piles and adopts the default NMFS TL coefficient of 15 for 20- and 24-inch piles. This model, based on the default practical spreading loss assumption and applicable TL coefficient, can be rearranged to estimate the propagation of underwater noise as follows:

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

where Δ is the difference between the SSL and noise level at which behavioral harassment may occur (i.e., approximately 120 dB for vibratory sources or 160 dB for impulsive sources). The SSL and the propagation of underwater noise vary by pile size and installation method (Table 6-4).

Land forms (including causeways, breakwaters, islands, and other land masses) impede the transmission of underwater sound and create shadows behind them where sound from construction is not audible. In Auke Bay, sound from the Project will be blocked by Auke Cape, Coghlan Island, Battleship Island, Suedla Island, Spuhn Island, and Douglas Island (Figure 1-2). The monitoring zone will be inclusive of all areas that may be exposed to noise levels in excess of 120 dB for vibratory sources and 160 dB for impulsive sources.

Level A Harassment

Sound propagation and the distances to the sound isopleths defined by NMFS for Level A harassment of marine mammals under the current Technical Guidance were estimated using the User Spreadsheet developed by NMFS for this purpose (NMFS 2018). The method uses estimates of SPL and duration of the activity to calculate the threshold distances at which a marine mammal exposed to those values would experience a PTS. Differences in hearing abilities among marine mammals are accounted for by use of weighting factor adjustments for the five functional hearing groups (NMFS 2016b). Pulse duration from the sound source verification studies used for source level estimates are unknown. All necessary parameters were available for the cumulative Single Strike Equivalent (SEL_{cum}) method for calculating isopleths, and therefore this method was selected. The SEL_{cum} method resulted in isopleths that



were larger than those calculated using the peak source level method, and therefore the SEL_{cum} isopleths were selected for the Project.

NMFS typically recommends a TL coefficient of 15 dB per tenfold increase in distance when site-specific empirical data are unavailable. Denes et al. (2016) estimated the TL coefficient for vibratory (16.4) and impact (14.6) installation of 30-inch diameter piles. Site-specific data for 20- and 24-inch piles are unavailable; therefore, this document uses the site-specific TL coefficients for 30-inch piles and adopts the default NMFS TL coefficient of 15 for 20- and 24-inch piles for calculation of Level A zone sizes.

To account for potential variations in daily productivity during impact installation, isopleths were calculated for different numbers of piles that could be installed each day (Table 6-5). Therefore, if the contractor installs fewer piles in a day than the maximum anticipated, the Level A harassment zone will be smaller. Similarly, if no marine mammals enter their respective Level A zones during impact installation of the first pile of the day, the monitoring zone for the next pile that same day will be smaller (e.g., the Level A zones for a three-pile day will be reduced in size to the Level A zones for a two-pile day for the second pile). Level A zones will be further reduced in size to those for a one-pile day for the final and third pile of the day, as long as no marine mammals have been exposed to Level A noise levels that day. The number of strikes per pile during impact installation is expected to not exceed 400 per pile during Project activities. Level A distances are provided in Table 6-5 for three production rates.

To avoid and minimize incidental Level A exposure of marine mammals, pile installation or removal will cease prior to a marine mammal entering the Level A harassment isopleth specific to the species and the in-water activity (including production rate) underway (Table 6-5). Shutdown zones will be implemented to prevent injury to marine mammals (Table 6-6; Figure 6-1). The shutdown zones are larger than the species-specific Level A harassment zones as defined under the MMPA. For species groups for which the shutdown zone varies by number of piles installed per day, only the largest shutdown zones (three piles per day) are shown in Figure 6-1. To avoid unauthorized Level A take, if Level A take numbers are approaching authorized levels, shutdown will be implemented before individuals reach the Level A zones.

Table 6-5. Calculated Distances to Level A Harassment Isopleths during Pile Installation and Removal

Activity	Pile Diameter(s)	Minutes per Pile or Strikes per Pile	Piles Installed or Removed per day	Level A Harassment Isopleth Distance (meters)				
				Cetaceans			Pinnipeds	
				LF	MF	HF	PW	OW
Vibratory Installation	30-inch	45 Minutes	3	31	4	45	20	2
	24-inch	45 Minutes	3	12	1	18	8	1
Vibratory Removal	30-inch	30 Minutes	3	25	3	35	16	2
	24-inch, 20-inch	30 Minutes	3	9	1	14	6	1
Impact Installation	30-inch	400 Strikes	3	499	17	597	263	18
			2	378	13	452	199	14
			1	235	8	281	124	9



Activity	Pile Diameter(s)	Minutes per Pile or Strikes per Pile	Piles Installed or Removed per day	Level A Harassment Isopleth Distance (meters)				
				Cetaceans			Pinnipeds	
				LF	MF	HF	PW	OW
	24-inch	400 Strikes	3	449	16	535	241	18
			2	343	13	409	184	14
			1	216	8	258	116	9

Note: LF = low frequency; MF = mid-frequency; HF = high frequency; PW = phocid in water; OW = otariid in water.



Table 6-6. Shutdown Zones during Pile Installation and Removal

Activity	Pile Diameter(s)	Minutes per Pile or Strikes per Pile	Piles Installed or Removed per day	Shutdown Zones (meters)				
				Cetaceans			Pinnipeds	
				LF	MF	HF	PW	OW
Vibratory Installation	30-inch	45 Minutes	3	50			20	
	24-inch	45 Minutes	3					
Vibratory Removal	30-inch	30 Minutes	3					
	24-inch, 20-inch	30 Minutes	3					
Impact Installation	30-inch	400 Strikes	3	500	20	600	270	20
			2	380		460	200	
			1	250		290	130	
	24-inch	400 Strikes	3	450		550	250	
			2	350		410	200	
			1	220		260	120	

Note: LF = low frequency; MF = mid-frequency; HF = high frequency; PW = phocid; OW = otariid.

Level B Harassment

Sound propagation and distances to the sound isopleths defined by NMFS for Level B harassment of marine mammals were estimated using the practical spreading loss model. The source levels for pile installation and removal were estimated using the results of measurements from the best available and most relevant sound source verification studies (Table 6-4). The Level B harassment zones for the Project are presented in Table 6-7 and shown in Figure 6-2.

Table 6-7. Distances to and Areas of Level B Harassment Isopleths for Different Pile Sizes and Types and Methods of Installation/Removal

Method and Pile Type	Distance to Level B Isopleth (meters)	Area of Level B Isopleth (km ²)
Vibratory Hammer (Level B Isopleth = 120 dB)		
30-inch steel piles	8,449	22.5
24-inch steel piles	5,412	15.3
20-inch steel piles	5,412	15.3
Impact Hammer (Level B Isopleth = 160 dB)		
30-inch steel piles	1,328	2.3
24-inch steel piles	1,000	1.5

Note: dB = decibels.



Figure 6-1. Shutdown Zones during Pile Installation and Removal at Auke Bay Ferry Terminal



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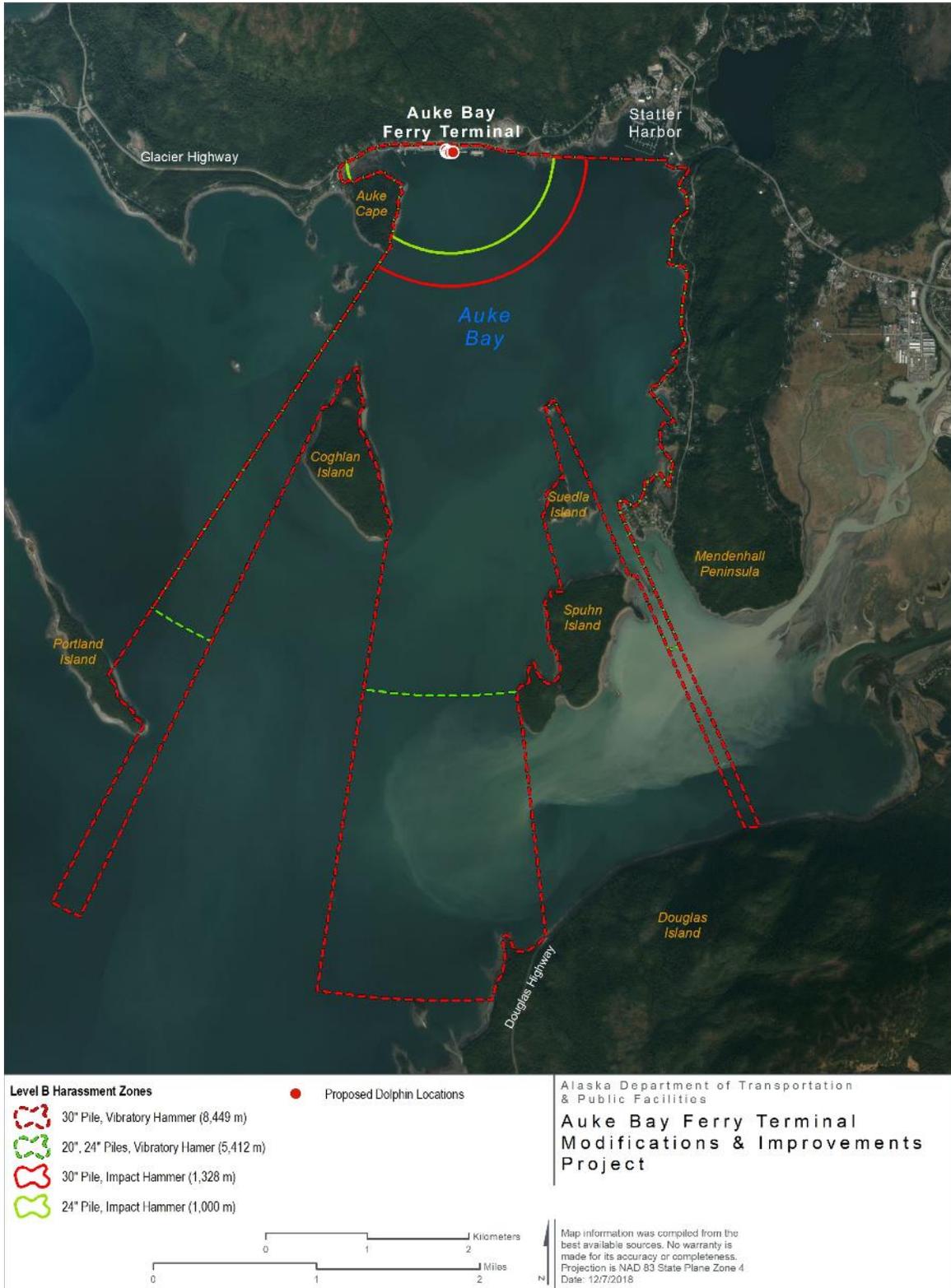


Figure 6-2. Level B Harassment Zones during Pile Installation and Removal at Auke Bay Ferry Terminal



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6.4.2 Airborne Noise

Pinnipeds can be affected by in-air noise when they are hauled out. Loud noises can cause hauled-out pinnipeds to panic back into the water, leading to disturbance and possible injury. For airborne sound exposure of hauled-out pinnipeds, NMFS uses criteria for Level B harassment of 90 dB re 20 µPa rms for harbor seals and 100 dB re 20 µPa rms for all other pinnipeds, including Steller sea lions.

The spherical spreading model described in Section 6.3.3 was revised to estimate noise threshold distances from the maximum anticipated in-air noise source level. The revised equation replaced ambient sound level with NMFS-defined noise thresholds as follows:

$$D = D_0 * 10^{((Construction\ Noise - Noise\ Threshold)/\alpha)}$$

Given the conservative source level of 110 dBA chosen for impact pile installation of 30-inch steel piles, the calculated isopleths for in-air noise can be used for all pile sizes and types associated with the Project. Installation of smaller piles is generally assumed to produce lower sound levels than installation of larger piles. The estimated distance to the airborne sound level threshold from pile installation of all pile types and sizes for the Project is 152 meters for seals and 48 meters for Steller sea lions (Table 6-8).

Table 6-8. Distances to which Airborne Sound will Attenuate to NMFS Threshold for Level B Harassment

Method, pile type	Harbor Seals (90 dB)	Other Pinnipeds (100 dB)
Impact Hammer		
All Project piles	152 meters (500 feet)	48 meters (157 feet)

Note: dB = decibels.

6.5 Estimated Takes

Estimated exposure and take of marine mammals associated with the Project is based on presence/absence, distribution, and abundance information presented in Section 4.

6.5.1 Steller Sea Lion

We conservatively estimate that one large group (121 individuals; see Section 4.1.2) of Steller sea lions may be exposed to Project-related underwater noise once per day during pile installation and removal activities, for a total of 3,267 exposures (27 days * 121 sea lions per day = 3,267). It is expected that the same individuals will be exposed on multiple days; therefore, the total number of individuals exposed by the Project will likely be fewer than 3,267.

As discussed in Section 4.1.2, only 2 percent of sea lions present in Auke Bay are expected to belong to the wDPS, for a total of 66 exposures of wDPS Steller sea lions and 3,201 exposures of eDPS Steller sea lions.

The largest Level A harassment zone for otariid pinnipeds extends 18 meters from the noise source (Table 6-5). Since the Project will implement a minimum 20-meter shutdown zone during all pile installation and removal (Table 6-6), no Level A take is requested for Steller sea lions. Although a 20-meter shutdown zone will be implemented during pile installation and removal, Level A take will not occur until an individual crosses the Level A harassment isopleth specific to the in-water activity underway. The in-air Level B harassment zone extends 48 meters from the noise source (Table 6-8). No Steller sea lions are known to haul out within 48 meters of any of



the Project component locations; therefore, exposure of hauled-out Steller sea lions to in-air noise is not anticipated.

6.5.2 Harbor Seal

Harbor seal haulouts are located within the Level B harassment zone for vibratory hammer activities as described in Section 4.2.2. For these reasons, we conservatively estimate that up to 52 harbor seals could be exposed to noise levels in excess of the Level B harassment threshold each day, for a total of 1,404 exposures (27 days * 52 seals per day = 1,404).

The largest Level A harassment zone for phocid pinnipeds extends 263 meters from the noise source (Table 6-5). There are no haulouts located within the Level A harassment zone, and although it is unlikely that harbor seals will enter this area without detection while underwater activities are underway, it is possible that harbor seals may approach and enter the Level A zone undetected. For this reason, the DOT&PF requests Level A take to safeguard against the possibility of Marine Mammal Observers (MMOs) being unable to detect a harbor seal within the Level A harassment zone (Table 6-5). Similar to other projects in Auke Bay and consistent with NMFS proposals (83 FR 52394), we estimate that up to 11 seals per day for 12 days of impact installation could occur within the Level A harassment zone during impact pile installation, for a total of 132 exposures (12 days * 11 seals per day = 132).

The in-air Level B harassment zone for harbor seals extends 152 meters from the noise source (Table 6-8). No harbor seals are known to haul out within 152 meters of the Project; therefore, exposure of hauled out harbor seals to in-air noise is not anticipated.

6.5.3 Harbor Porpoise

Harbor porpoises are non-migratory; therefore, our exposure estimates are not dependent on season. While sightings of harbor porpoises in Auke Bay are rare (Section 4.3.2), there is a potential for them to occur in the Project area. Based on information synthesized in Section 4.3.2, we assume that one pair of harbor porpoises per day could enter the Level B harassment zone, and therefore we estimate 54 exposures over the course of the Project (27 days * 2 porpoises per day = 54).

The largest Level A harassment zone for harbor porpoises extends 597 meters from the noise source during impact installation of 30-inch piles (Table 6-5). Harbor porpoises are an inconspicuous species and are challenging for MMOs to sight, making any approach to a monitoring zone potentially difficult to detect. Because harbor porpoises move quickly and elusively, it is possible, but unlikely, that harbor porpoises may enter the Level A harassment zone (Table 6-5) without detection. As such, the DOT&PF requests small numbers of Level A take for harbor porpoises during the Project. We conservatively assume that one pair of harbor porpoises may enter the Level A harassment zone every other day, and therefore estimate a total of 12 exposures to Level A harassment levels over the 12 days of impact installation (12 days * 2 porpoises every other day = 12).

6.5.4 Dall's Porpoise

Dall's porpoises are not expected to occur in Auke Bay because the shallow water habitat of the bay is atypical of areas where Dall's porpoises usually occur (see Section 4.4.2). However, recent research indicates that Dall's porpoises may opportunistically exploit nearshore habitats when predators, such as killer whales, are absent (Moran et al. 2018b). Therefore, we anticipate approximately one observation of one large Dall's porpoise pod (15 individuals) in the Project area during in-water construction in both March and April. Following this method, we estimate



that one pod may be exposed to Level B harassment in both March and April for a total of 30 Dall's porpoises (2 months * 15 porpoises per month = 30).

Shutdown protocol and implementation of Level A zones will be the same for Dall's porpoises as for harbor porpoises and other high-frequency cetaceans (e.g., see Section 6.5.3). The largest Level A harassment zone for Dall's porpoises extends 597 meters from the noise source during impact installation of 30-inch piles (Table 6-5). Given the larger group size and more conspicuous rooster-tail generated by swimming Dall's porpoises, which make them more noticeable than harbor porpoises, Level A take for Dall's porpoises is not requested.

6.5.5 Killer Whale

Killer whales are observed occasionally during summer throughout Lynn Canal (see Section 4.5.2), but their presence in Auke Bay is unlikely. As a precaution, because Level B harassment zones extend beyond Auke Bay, the DOT&PF requests Level B take for one killer whale pod of up to 15 individuals once during the Project (15 exposures for all 6 months).

Shutdown protocol and implementation of Level A zones will be the same for killer whales as for Steller sea lions (e.g., see Section 6.5.1, Table 6-6) during impact pile installation. Marine mammal monitoring will minimize the potential for Level A harassment of killer whales, which are generally conspicuous. All pile installation/removal will be shut down prior to a killer whale entering the Level A harassment zone specific to the pile size and installation/removal method underway. No Level A take is requested for killer whales.

6.5.6 Humpback Whale

As discussed in Section 4.6.2, use of Auke Bay by humpback whales is intermittent and irregular year-round. NMFS recently predicted that approximately two humpback whales per day may be exposed to underwater noise associated with the Statter Harbor Improvements Project (83 FR 52394). During the Project, the propagation of noise is expected to extend 3.5 times farther into Auke Bay and encompass a proportionately larger area than the Statter Harbor project. However, because underwater sound does not propagate through land, the underwater portion of the Level B harassment zones is truncated by numerous obstructions in Auke Bay and nearby waters (Figure 6-2). Pile installation and removal will occur sporadically throughout the day, lasting only minutes to a few hours. Thus, based on the available information synthesized in Section 4.6.2 and observations of humpback whales within Auke Bay during winter, the DOT&PF predicts that up to 4 individuals may be exposed to Project-related underwater noise each day during the 27 days of the Project, or a total of 108 individuals (4 per day * 27 days = 108 humpback whales). It is likely that some individuals will be exposed more than once during the Project, so the total number of individual whales exposed is likely to be less than 108.

Wade et al. (2016) estimated that approximately 6.1 percent of humpback whales in Southeast Alaska are members of the Mexico DPS, while all others are members of the Hawaii DPS. Therefore, we predict 7 of the exposures (108 whales x 0.061 = 6.6) will be of Mexico DPS individuals and 101 exposures will be of Hawaii DPS individuals.

The largest Level A harassment zone for humpback whales extends 499 meters from the noise source during impact installation of 30-inch piles (Table 6-5). Marine mammal monitoring will minimize the potential for Level A harassment of humpback whales. All pile installation/removal will be shut down prior to a humpback whale entering the shutdown zone specific to the in-water activity underway at the time (Table 6-6). No Level A take is requested for humpback whales.



6.5.7 Minke Whales

Minke whale abundance throughout Southeast Alaska is low, and anecdotal reports have not included minke whales near the Project area. However, minke whales are distributed throughout a wide variety of habitats and have been observed in Glacier Bay; therefore, this species could occur near the Project area. Therefore, the DOT&PF requests take of 1 minke whale per month to Level B harassment for a total of 6 potential exposures (6 months * 1 whale per month = 6).

Shutdown protocol and implementation of Level A harassment zones will be the same for minke whales as for humpback whales. Level A take is not requested for minke whales.

6.6 All Marine Mammal Takes Requested

6.6.1 Pile Installation and Removal

The analysis of marine mammal take predicts 4,740 potential exposures of marine mammals to Level B harassment and 144 potential exposures of marine mammals to Level A harassment (Table 6-9).

Table 6-9. Summary of the Estimated Numbers of Marine Mammals Potentially Exposed to Level B Harassment Sound Levels

Species	DPS/Stock	Estimated Number of Exposures to Level B Harassment	Estimated Number of Exposures to Level A Harassment	Total Estimated Exposures (Level A and Level B)	Stock Abundance	Percent of Population
Steller sea lion	Eastern DPS	3,201	0	3,201	41,638	7.7
	Western DPS	66	0	66	54,267	0.1
Harbor seal	Lynn Canal/Stephens Passage	1,272	132	1,404	9,478	14.8
Harbor porpoise	Southeast Alaska	42	12	54	975	5.5
Dall's porpoise	Alaska	30	0	30	83,400	<0.1
Killer whale	West Coast Transient				243	6.2 ^a
	Alaska Resident	15	0	15	2,347	0.6 ^a
	Northern Resident				261	5.8 ^a
Humpback whale	Hawaii DPS	101	0	101	11,398	0.9 ^b
	Mexico DPS	7	0	7	3,264	0.2 ^b
Minke whale	Alaska	6	0	6	Unknown	N/A
Total	N/A	4,740	144	4,884	N/A	N/A

Note: DPS = distinct population segment.

^a These percentages assume that all takes come from each individual killer whale stock; thus the percentage should be adjusted down if multiple stocks are actually affected.

^b Assumes that 6.1 percent of humpback whales exposed are members of the Mexico DPS (Wade et al. 2016).

7 DESCRIPTION OF POTENTIAL IMPACTS ON MARINE MAMMALS

The ability to hear and transmit sound (echolocation/vocalization) is vital for marine mammals to perform several life functions. Marine mammals use sound to gather and understand information about their current environment, including detecting prey and predators. They also use sound to communicate with one another. The distance a sound travels through the water depends highly on existing environmental conditions (sea floor topography and ambient noise levels) and characteristics of the sound (source levels and frequency; Richardson et al. 1995). Impacts on marine mammals can vary among species, based on their sensitivity to sound and their ability to hear different frequencies. The Project may impact marine mammals behaviorally and physiologically from temporary increases in underwater and airborne noises during construction activities. The level of impact on marine mammals from construction activities will vary depending on the species of marine mammal, the distance between the marine mammal and the construction activity, the intensity and duration of the construction activity, and the environmental conditions.

7.1 Assessment of Potential Acoustic Impacts

Behavioral and physiological impacts from noise exposure differ among species. Differences in responses have also been documented between age and sex classes. Younger animals are often more sensitive to noise disturbance, and noise can therefore have a greater effect on them (NRC 2003).

Behavioral and physiological changes that may result from increased noise levels include changes in tolerance levels; masking of natural sounds; behavioral disturbances; and temporary or permanent hearing impairment, or non-auditory physical effects (Richardson et al. 1995). Richardson et al. (1995) have suggested four zones (described below) to assess the potential effects of noise on marine mammals.

7.1.1 Zone of Hearing Loss, Discomfort, or Injury

This is the area within which the received sound level is high enough to cause discomfort or tissue damage to auditory or other systems. Temporary or permanent reduction in hearing sensitivity may result from high received sound levels. An animal may experience TTS when hearing loss is temporary, or PTS when partial or full hearing loss is permanent. The level of hearing loss depends on the sound frequency, intensity, and duration (see Section 6.2.1). Marine mammals exposed to high received sound levels may also experience non-auditory physiological effects such as increased stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. PTS and TTS may reduce an animal's ability to avoid predators, communicate with others, or forage effectively. TTS is not considered injurious and will constitute a Level B take.

Kastak and Schusterman (1995) tested in-air auditory thresholds by exposing a harbor seal inadvertently to broadband construction noise for 6 days, with intermittent exposure averaging 6 to 7 hours per day. When the harbor seal was tested immediately upon cessation of the noise, a TTS of 8 dB at 100 Hz was evident. Following 1 week of recovery, the harbor seal's hearing threshold was within 2 dB of its original level.



Pure-tone sound detection thresholds were obtained in-water for harbor seals before and immediately following exposure to octave-band noise (Kastak et al. 1999). Test frequencies ranged from 100 Hz to 2 kHz, and octave-band sound exposure levels (SELs) were approximately 60 to 75 dB. Each harbor seal was trained to dive into a noise field and remain stationed underwater during a noise-exposure period that lasted a total of 20 to 22 minutes. The average threshold shift relative to baseline thresholds for the harbor seals following noise exposure was 4.8 dB, and the average shift following the recovery period was 20.8 dB (Kastak et al. 1999). Therefore, PTS and TTS as a result of the Project are not expected to occur in any marine mammal species, because source levels of pile installation are lower than those in the above-referenced TTS studies, and implementation of mitigation measures will help avoid potential close approach of animals to activities that could result in Level A takes (i.e., injury/mortality).

7.1.2 Zone of Masking

This is the area within which noise is strong enough to interfere with the detection of other sounds, including communication calls, prey or predator sounds, and other environmental sounds. Masking is considered Level B harassment and is usually considered 160 dB for impact noise and 120 dB for continuous noise.

Marine mammal signals may be masked by increased noise levels or overlapping frequencies. Research has indicated that the majority of vibratory activity falls within 400 to 2,500 Hz (Blackwell 2005; URS 2007). The frequency range of Steller sea lions' vocalization is unknown; however, Steller sea lions have been documented producing low-frequency vocalizations (Kastelein et al. 2005). Harbor seals produce social calls at 500 to 3,500 Hz and clicks from 8 to 150 kHz (reviewed in Richardson et al. 1995). Harbor porpoises produce acoustic signals in a very broad frequency range, <100 Hz to 160 kHz (Verboom and Kastelein 2004). Killer whales produce whistles between 1.5 and 18 kHz, and pulsed calls between 500 Hz and 25 kHz. Echolocation clicks are far above the frequency range of the sounds produced by vibratory pile installation.

The Project is within an existing active ferry terminal and nearby harbor area with regular vessel activity, including recreational craft, local ferries and tourist cruises, commercial fishing vessels, and daily arrivals and departures of an Alaska state ferry. It is likely that marine mammals in the Project area have become habituated to increased noise levels. Implementation of the proposed mitigation measures (Section 11) will reduce impacts on marine mammals, with any minor masking occurring near the sound source, if at all.

7.1.3 Zone of Responsiveness

This is the area within which marine mammals react behaviorally or physiologically from exposure to increased noise levels. The level of effect is dependent on the acoustical characteristics of the noise, current physical and behavioral state of the animals, ambient noise levels and environmental conditions, and context of the sound (e.g., if it sounds similar to a predator; Richardson et al. 1995; Southall et al. 2007). Behavioral effects that are temporary may indicate that the animal has simply heard a sound, and the effect may not be long-term (Southall et al. 2007). Behavioral and physiological effects described here will be considered Level B harassment.

Responses from marine mammals in the presence of pile installation and removal might include a reduction of acoustic activity, a reduction in the number of individuals in the area, and avoidance of the area. Of these, temporary avoidance of the noise-impacted area is the most common response. Avoidance responses may be initially strong if the marine mammals move



rapidly away from the source, or weak if movement is only slightly deflected away from the source. Noise from pile installation could displace marine mammals from the immediate area of the activity; however, they will likely return after pile installation is completed, as demonstrated by a variety of studies on temporary displacement of marine mammals by industrial activity (reviewed in Richardson et al. 1995). Any masking events that could possibly rise to Level B harassment under the MMPA will occur concurrently within the zones of behavioral harassment already estimated for vibratory and impact pile installation, and have already been taken into account in the exposure analysis.

7.1.4 Zone of Audibility

This is the area within which the animal might hear the noise; it is the most extensive of the four zones. Marine mammals as a group have functional hearing ranges of 10 Hz to 180 kHz, with thresholds of best hearing near 40 dB (Southall et al. 2007). Marine mammals can typically be divided into three groups that have consistent patterns of hearing sensitivity: small odontocetes (e.g., harbor porpoise), medium-sized odontocetes (e.g., killer whale), and pinnipeds (e.g., Steller sea lion and harbor seal). Difficulties in human ability to determine the audibility of a particular noise for other species has so far precluded development of applicable criteria for the zone of audibility. This zone does not fall in the sound range of a “take” as defined by NMFS.

Repeated or sustained disruption of important behaviors (e.g., feeding, resting, traveling, and socializing) is more likely to have a demonstrable impact than a single exposure (Southall et al. 2007). However, it is likely that marine mammals exposed to repetitious construction sounds will become habituated, desensitized, and tolerant after initial exposure to these sounds. Marine mammals residing in and transiting this area are routinely exposed to sounds louder than 120 dB and continue to use this area; therefore, they do not appear to be harassed by these sounds, or they have become habituated.

7.2 Conclusions Regarding Impacts to Species or Stocks

Incidental take is expected to result in only short-term changes in behavior, such as avoidance of the Project area, changes in swimming speed or direction, and changes in foraging behavior. Such impacts are unlikely to have any effect on recruitment or survival and, therefore, will have a negligible impact on the affected stocks of Steller sea lions, harbor seals, harbor porpoises, Dall’s porpoises, killer whales, humpback whales, and minke whales. Implementation of mitigation measures proposed in Section 11 is likely to minimize most potential adverse impacts to individual marine mammals from pile installation or removal. Impacts on individual Steller sea lions, harbor seals, harbor porpoises, Dall’s porpoises, killer whales, humpback whales, and minke whales are expected to be small and of short duration. Nevertheless, some level of disturbance impact is unavoidable. The expected level of unavoidable impact (defined as an acoustic or harassment “take”) is defined in Section 6.

Requested Level B take of marine mammals will likely include multiple (estimated as daily) takes of the same individual(s), resulting in estimates of take (as percentage of the DPS/stock) that are high compared to actual take.



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8 DESCRIPTION OF POTENTIAL IMPACTS ON SUBSISTENCE USES

Alaska Natives have traditionally harvested subsistence resources in Southeast Alaska for many hundreds of years, particularly large terrestrial mammals, marine mammals, salmon, and other fish (ADF&G 1997). There are no subsistence activities that target humpback whales, and subsistence hunters rarely target Steller sea lions within the Project area; however, harbor seals are regularly harvested for subsistence near Auke Bay. Local Haida and Tlingit Native communities harvest harbor seals for meat, oil, blubber, and skins within the areas of Icy Strait, Glacier Bay, and local waters adjacent to Auke Bay (ADF&G 2009).

No long-term impact on Steller sea lion populations or their habitat resulting from Project activities is anticipated. Since subsistence hunters rarely target sea lions in the Auke Bay/Juneau area, temporary displacement of animals from the Project area is expected to have no effect on availability of Steller sea lions for subsistence purposes.

The proposed action is not likely to adversely impact individual harbor seals or the local population beyond short-term, noise-induced harassment. Temporary displacement from preferred haulout or foraging areas in Auke Bay may make harbor seals less accessible to local subsistence hunters in the immediate area; however, this is considered a negligible impact on harbor seal subsistence hunting in the overall Auke Bay/Juneau area.

Changes to availability of subsistence resources will be negligible or non-existent as a result of Project activities.



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9 DESCRIPTION OF POTENTIAL IMPACTS ON MARINE MAMMAL HABITAT

9.1 Effects of Project Activities on Marine Mammal Habitat

The Project will occur within the same footprint as existing marine infrastructure. The nearshore and intertidal habitat where the Project will occur is an area of relatively high marine vessel traffic. Most marine mammals do not generally use the area within the footprint of the Project area. Temporary, intermittent, and short-term habitat alteration may result from increased noise levels within the Level A and Level B harassment zones. Effects on marine mammals, as described above, will be limited to temporary displacement from pile installation and removal noise, and effects on prey species (Section 9.2).

Although Southeast Alaska in its entirety is listed as a Biologically Important Area for humpback whales, the Project area is not unusually important for the species. Furthermore, mitigation measures (Section 11), such as marine mammal monitoring and implementation of shutdowns, will limit the number of humpback whales exposed to underwater noise as a result of the Project. Avoidance of the Project area by humpback whales is possible, but will be temporary and intermittent in duration.

9.2 Effects of Project Activities on Marine Mammal Prey Habitat

Essential Fish Habitat (EFH) has been designated within the Project area for all five species of salmon (i.e., chum salmon, pink salmon, coho salmon, sockeye salmon, and Chinook salmon; NMFS 2017), which are common prey of marine mammals. Auke Creek, an outlet stream of Auke Lake, is the only salmon spawning stream in Auke Bay; however, adverse effects on EFH in this area are not expected. Fish populations in the Project area that serve as marine mammal prey could be temporarily affected by noise from pile installation and removal. The frequency range in which fish generally perceive underwater sounds is 50 to 2,000 Hz, with peak sensitivities below 800 Hz (Popper and Hastings 2009). Fish behavior or distribution may change, especially with strong and/or intermittent sounds that could harm fish. High underwater SPLs have been documented to alter behavior, cause hearing loss, and injure or kill individual fish by causing serious internal injury (Hastings and Popper 2005).

Pile installation and removal may result in a small increase in sedimentation within a few feet of the piles. A small amount of sediment may be deposited in proximity to each pile. Minor and temporary increases in turbidity may result from this process, but the effects on fish and marine mammal prey will be negligible. Indirect effects on prey will be insignificant and discountable due to the temporary nature of the activity, and are expected to be undetectable to marine mammals.

In general, impacts on marine mammal prey species are expected to be minor and temporary. The area likely impacted by the Project is relatively small compared to the available habitat in Auke Bay and throughout Southeast Alaska. The most likely impact to fish from the Project will be temporary behavioral avoidance of the immediate area, although any behavioral avoidance of the disturbed area will still leave significantly large areas of fish and marine mammal foraging habitat. Therefore, the impact on marine mammal prey during the Project is expected to be negligible.



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10 DESCRIPTION OF POTENTIAL IMPACTS FROM LOSS OR MODIFICATION OF HABITAT ON MARINE MAMMALS

The potential impacts of the Project on marine mammal habitat are discussed in Section 9. The effects of the Project on marine mammal habitat are expected to be short-term and minor. Permanent loss of habitat is limited to the footprint of the piles only. One potential impact on marine mammals associated with the Project could be a temporary loss of habitat because of elevated noise levels. Displacement of marine mammals by noise will not be permanent and will not have long-term effects. The Project is not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations, because pile installation and removal will be temporary and intermittent.



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11 MITIGATION MEASURES

The estimates outlined in Section 6 represent the maximum potential numbers of marine mammals exposed to Project-related noise, including multiple takes of the same resident individuals that could be exposed to acoustic sources reaching Level B harassment levels. The DOTP&F proposes to employ a number of mitigation measures to minimize the number of marine mammals affected. Mitigation measures will include those that address all phases of construction in general, those that are specific to physical pile installation/removal, actions that pertain to Level A and Level B harassment zones, and those that involve observation of marine mammals in the Project area. Marine mammal monitoring and mitigation methods are described in more detail in the Marine Mammal Monitoring Plan (Appendix B).

11.1 Pile Installation and Associated Activities

Pile installation mitigation measures include:

- Marine Mammal Observers (MMOs) will be employed as described in Section 13.
- Prior to the beginning of pile installation/removal, MMOs will visually inspect the Level B harassment zone for the presence of marine mammals from strategic locations. The Level B harassment zone will vary based on the size of pile and installation method underway. If a marine mammal is observed, it will be monitored until it has departed the Level B harassment zone. Soft-start or ramp-up procedures may be initiated while the marine mammal is within the Level B harassment zone. As long as the marine mammal does not approach the construction site in such a way that injury or harm is possible, and assuming that take has not exceeded the number authorized, all pile installation and removal may continue while the marine mammal is within the Level B harassment zone (each individual will be considered a Level B take as allowed under the IHA to be issued by NMFS).
- In order to prevent harm or injury to marine mammals, the Contractor will implement conservative shutdown zones for marine mammals during pile installation and removal (Table 6-6). All shutdown zones are greater than the corresponding Level A harassment zone calculated for the species group and pile installation/removal method (Table 6-5). If a marine mammal approaches the shutdown zone specific to the species group and pile installation/removal method underway, the activity will cease until the marine mammal has left the shutdown zone.
- Ongoing in-water pile installation/removal will be stopped during periods when conditions such as low light, darkness, high sea state, fog, ice, rain, glare, or other conditions prevent effective marine mammal monitoring within the shutdown zones described above.
- Before impact proofing occurs, the Contractor will employ a ramp-up procedure to minimize impacts. The following guidelines will be employed by the Contractor:
 - If a marine mammal is present within the Level A harassment zone, ramping up will be delayed until the animal(s) leaves the Level A harassment zone. Activity will begin only after the MMO has determined, through sighting, that the animal(s) has moved outside the Level A harassment zone.



- If a marine mammal is present in the Level B harassment zone, ramping up may begin and a Level B take will be recorded. Ramping up may occur when these species are in the Level B harassment zone, whether they enter the Level B zone from the Level A zone or from outside the Project area.
- If a marine mammal is present in the Level B harassment zone, the Contractor may elect to delay ramping up to avoid a Level B take. To avoid a Level B take, ramping up will begin only after the MMO has determined, through sighting, that the animal(s) has moved outside the Level B harassment zone or 15 minutes has elapsed without resighting the marine mammal.
- No vibratory soft start is required.

11.2 Harassment Zones

Modeling results for Level A and Level B harassment zones discussed in Section 6 were used to develop mitigation measures for pile installation and removal. During pile installation and removal, the shutdown zone will include all areas where the underwater SPLs are anticipated to equal or exceed the Level A (injury) harassment criteria (see Table 6-5).

For those marine mammals for which Level B take has not been requested, in-water pile installation/removal will shut down immediately when an animal is sighted and before the animal has entered the Level B harassment zone. In-water pile installation and removal will remain shut down until marine mammals for which no take has been authorized have left the harassment zone. If a marine mammal authorized for Level B take is present in the Level B harassment zone, in-water pile installation and removal may continue, and a Level B take will be recorded. Pile installation and removal may occur when these species are in the Level B harassment zone, whether they entered the Level B zone from the Level A zone (if relevant), or from outside the Project area. If Level B take reaches the authorized limit, pile installation will be stopped as these species approach, to avoid additional take of these species.

Implementation of the above mitigation measures will be completed by MMOs as described in Section 13.



12 MEASURES TO REDUCE IMPACTS ON SUBSISTENCE USERS

The Project is not known to occur in an important subsistence hunting area. The Project area is a developed area with regular marine vessel traffic. However, the DOT&PF plans to provide advance public notice of construction activities to reduce construction impacts on local residents, ferry travelers, adjacent businesses, and other users of Auke Bay and nearby areas. This will include notification to local Alaska Native tribes that may have members who hunt marine mammals for subsistence. Of the marine mammals considered in this IHA application, only harbor seals are known to be used for subsistence in the region. If any tribes express concerns regarding Project impacts to subsistence hunting of marine mammals, further communication with the DOT&PF will take place, including provision of any Project information, and clarification of any mitigation and minimization measures that may reduce potential impacts to marine mammals used for subsistence.



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13 MONITORING AND REPORTING

Monitoring measures will be implemented along with mitigation measures (Section 11) to avoid and minimize impacts on marine mammals during the Project, as discussed in detail in the Marine Mammal Monitoring Plan (Appendix B), which will be submitted prior to issuance of the IHA.

Trained MMOs will collect sighting data and behavioral responses to pile installation and removal for all marine mammals observed within the harassment zones during these activities.

Trained or experienced MMOs will be present during all pile installation and removal using impact and vibratory methods. MMOs must be able to positively identify the marine mammals in the area and have prior training or expertise in monitoring and surveying marine mammals, with credentials available for review. MMOs must maintain verbal contact with construction personnel to immediately call for a halt of pile installation and removal to avoid exposures to noise, as described in Section 11.2.

13.1 MMO Qualifications

Marine mammal monitoring will be conducted by MMOs who meet or exceed the minimum qualifications identified by NMFS in the final IHA. These include the following:

- MMOs will be independent observers (i.e., not construction personnel).
- At least one MMO must have prior experience working as an observer.
- Other observers may substitute education (undergraduate degree in biological science or related field) or training for experience.
- Two or more MMOs will be responsible for monitoring each Project component. One MMO will be designated as the lead MMO or monitoring coordinator. The lead MMO must have prior experience working as an observer.
- MMOs must have:
 - The ability to conduct field observations and collect data according to assigned protocols.
 - Experience or training in the field identification of marine mammals, including the identification of behaviors.
 - Sufficient training, orientation, or experience with construction operations to provide for personal safety during observations.
 - Writing skills sufficient to prepare a report of observations, including, but not limited to:
 - The number, species, and behavior of marine mammals observed
 - Dates and times when in-water pile installation and removal were conducted
 - Dates and times when in-water pile installation and removal were suspended to avoid potential harassment of marine mammals observed within the harassment zones



- The ability to communicate orally, by radio, or in person with Project personnel to provide real-time information on marine mammals observed in the area.

13.2 Observations

MMOs will be positioned at the best practical vantage point(s). Locations from which MMOs will be able to monitor for marine mammals are readily available from publicly accessible shoreside areas at the Auke Bay Ferry Terminal and, if necessary, other public and private points along the Glacier and Douglas highways. Monitoring locations will be selected by the Contractor during pre-construction. MMOs will monitor for marine mammals entering the Level B harassment zones from the north or south. The position(s) may vary based on construction activity and location of piles or equipment. At least one of the monitoring locations will have the following characteristics:

- An unobstructed view of the pile being driven, and
- An unobstructed view of the Level A harassment zones.

This central position will generally be staffed by the lead MMO, who will monitor the shutdown zones and communicate with construction personnel about shutdowns and management of take. The MMO at this location will be able to see at least a 600-meter radius, which exceeds the largest Level A zone, around the construction site. Walking or otherwise moving around the general construction site may be helpful for monitoring the shutdown zones in their entirety. MMOs stationed along the road system will watch for marine mammals entering and leaving Auke Bay and will alert the lead MMO of the number and species sighted, so that no unexpected marine mammals will approach the construction site. This will avoid and minimize Level A take of all species.

The MMOs will begin observations 30 minutes prior to the start of pile installation/removal. At least two MMOs will be available to observe during rotating shifts of 4–6 hours, or as needed, each day to prevent fatigue.

MMOs will have no other construction-related tasks or responsibilities while monitoring for marine mammals. MMOs will understand their roles and responsibilities before beginning observations. Each MMO will be trained and provided with reference materials to ensure standardized and accurate observations and data collection. A clear authorization and communication system will be in place to ensure that MMOs and construction crew members understand their respective roles and responsibilities.

Specific aspects and protocols of observations will also include the following:

- If waters exceed a sea-state that restricts the MMO's ability to make observations within the Level A harassment zone of pile driving (e.g., if there is excessive wind or fog), pile installation and removal will be halted. Pile driving will not be initiated until the entire Level A harassment zone is visible.
- If any marine mammal species not authorized for take is encountered during pile installation or removal and is likely to be exposed to Level B harassment, in-water pile installation or removal will be halted. If take occurs, the observations will be reported to NMFS' Office of Protected Resources.
- When a marine mammal is observed, its location will be determined using a rangefinder to verify distance and a GPS or compass to verify heading.



- The MMOs will record any authorized cetacean or pinniped present during monitoring and the harassment zone within which it is located, if applicable. The harassment zones are described in Table 6-5 and Table 6-7 and shown on Figure 6-2. .
- Ongoing in-water pile installation/removal may be continued during periods when conditions such as low light, high sea state, fog, ice, rain, or glare prevent effective marine mammal monitoring of the entire Level B harassment zone. MMOs will continue to monitor the visible portion of the Level B harassment zone throughout pile installation and removal.

13.3 Data Collection

NMFS requires that MMOs use NMFS-approved sighting forms (see Appendix B) that contain the following information:

- Date and time that pile installation begins or ends
- Construction activities occurring during each observation period
- Weather (e.g., wind, precipitation, fog)
- Tide state and water currents
- Visibility
- Species, numbers, and, if possible, sex and age class of marine mammals
- Marine mammal behavior patterns observed, including bearing and direction of travel, and, if possible, the correlation to SPLs
- Distance from pile installation site to marine mammals, if pile installation is occurring during marine mammal observations; and
- Other human activity in the area.

13.4 Reporting

A draft report will be submitted to NMFS within 90 calendar days of the completion of marine mammal monitoring. A final report will be prepared and submitted to NMFS within 30 days following receipt of comments on the draft report from NMFS. To the extent practicable, the MMOs will record behavioral observations that may make it possible to determine if the same or different individuals are being “taken” as a result of Project activities over the course of a day.

In general, reporting will include:

- Descriptions of any observable marine mammal behavior in the Level A and Level B harassment zones
- Descriptions of in-water and in-air construction activities occurring at the time of the observable behavior
- Actions performed to minimize impacts to marine mammals (e.g., shutdowns)
- Times when work was stopped and resumed due to the presence of marine mammals



- Results, which include the detections of marine mammals, species and numbers observed, sighting rates and distances, and behavioral reactions within the Level A and Level B harassment zones
- A refined take estimate based on the number of marine mammals observed during the course of construction

See the Marine Mammal Monitoring Plan (Appendix B) for more detail.



14 SUGGESTED MEANS OF COORDINATION

To minimize the likelihood that impacts will occur to the species, stocks, and subsistence use of marine mammals, all Project activities will be conducted in accordance with federal, state, and local regulations. To further minimize potential impacts from the planned Project, the DOT&PF will continue to cooperate with NMFS and other appropriate federal agencies (e.g., U.S. Fish and Wildlife Service, USACE), and the State of Alaska.

The DOT&PF will cooperate with other marine mammal monitoring and research programs taking place in the Auke Bay area. The DOT&PF will also assess mitigation measures that can be implemented to eliminate or minimize impacts from these activities. The DOT&PF will make available its field data and behavioral observations on marine mammals that occur in the Project area. Results of monitoring efforts will be provided to NMFS in a draft summary report within 90 calendar days of the conclusion of monitoring. This information will be made available to regional, state, and federal resource agencies, universities, and other interested private parties upon written request to NMFS.



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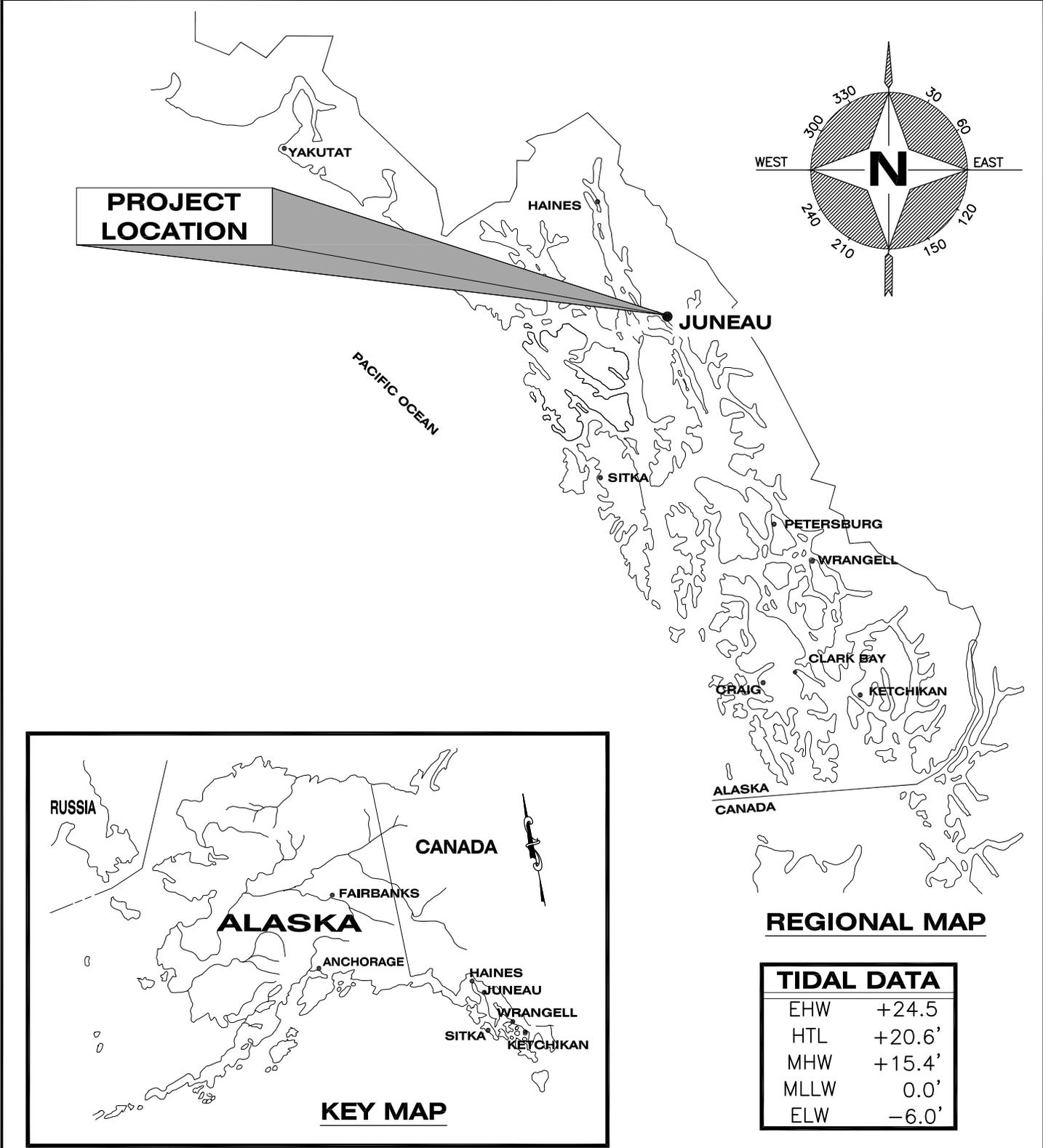
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Appendix A

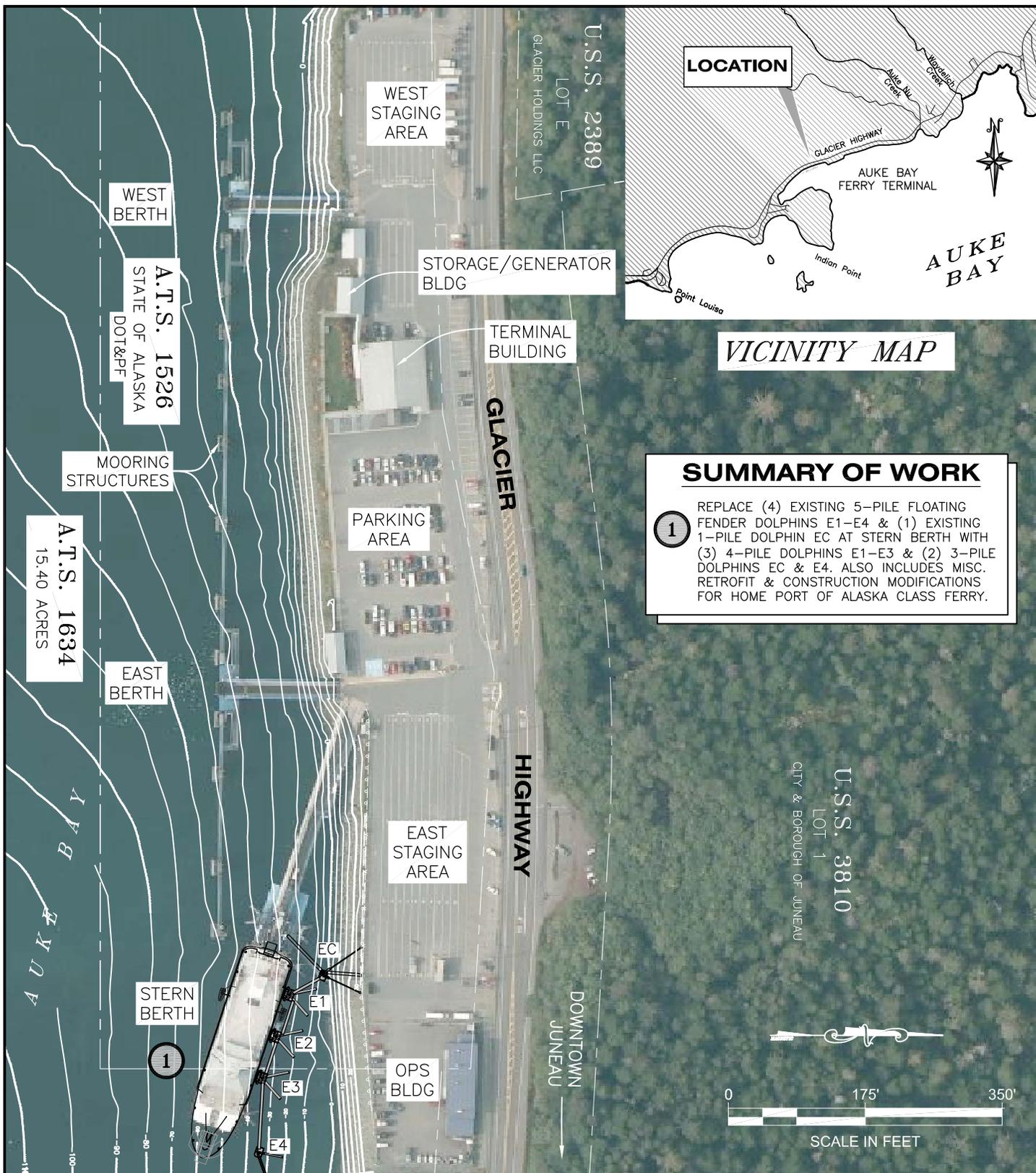
Project Site Plan Drawings



ALASKA STATE DEPT. OF TRANSPORTATION
AND PUBLIC FACILITIES
DESIGN & ENGINEERING SERVICES DIVISION
SOUTHCOAST REGION

KEY & REGIONAL MAPS

JUNEAU, AK
AUKE BAY FT MODIFICATIONS
& IMPROVEMENTS
DATE: JAN. 2019 SHEET **1** OF **4**



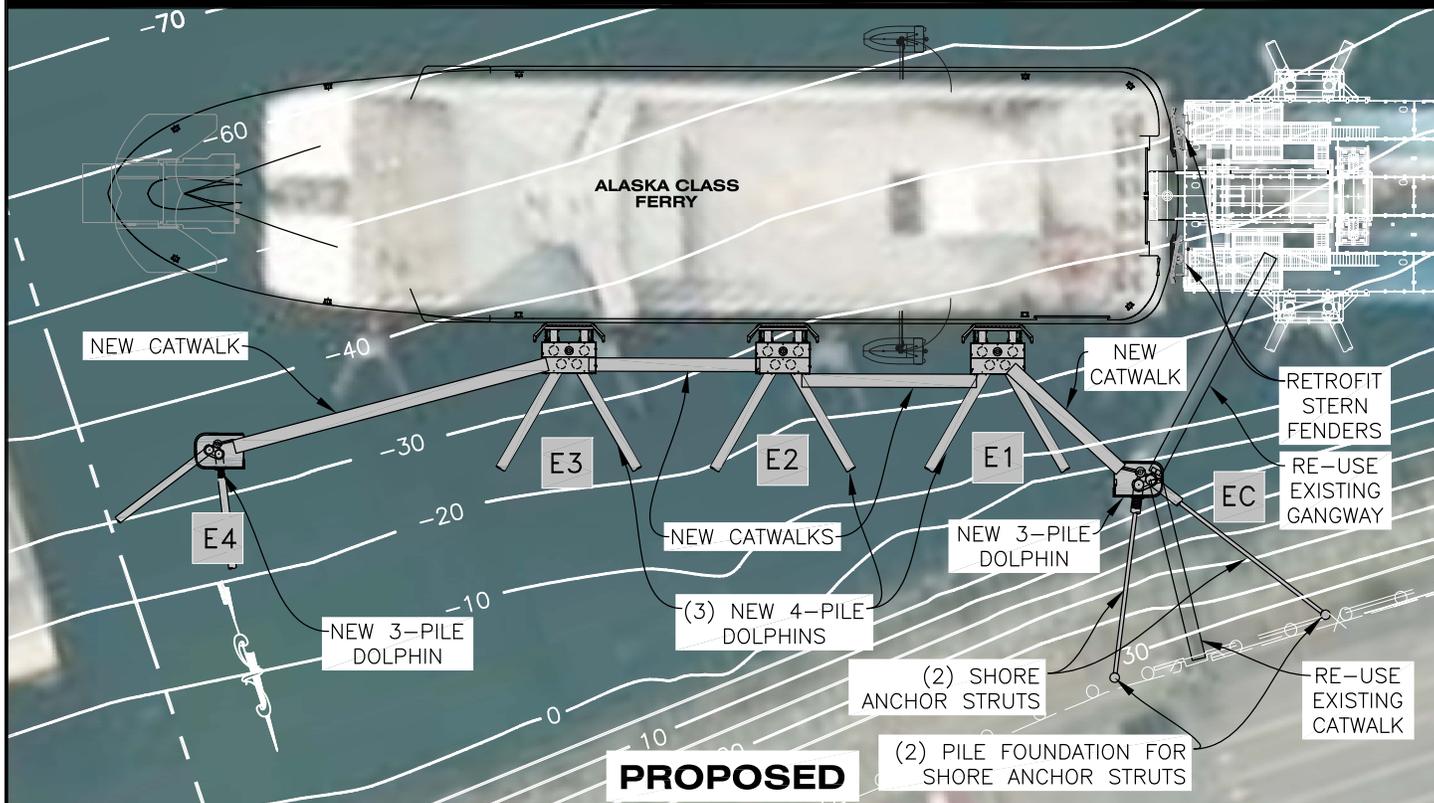
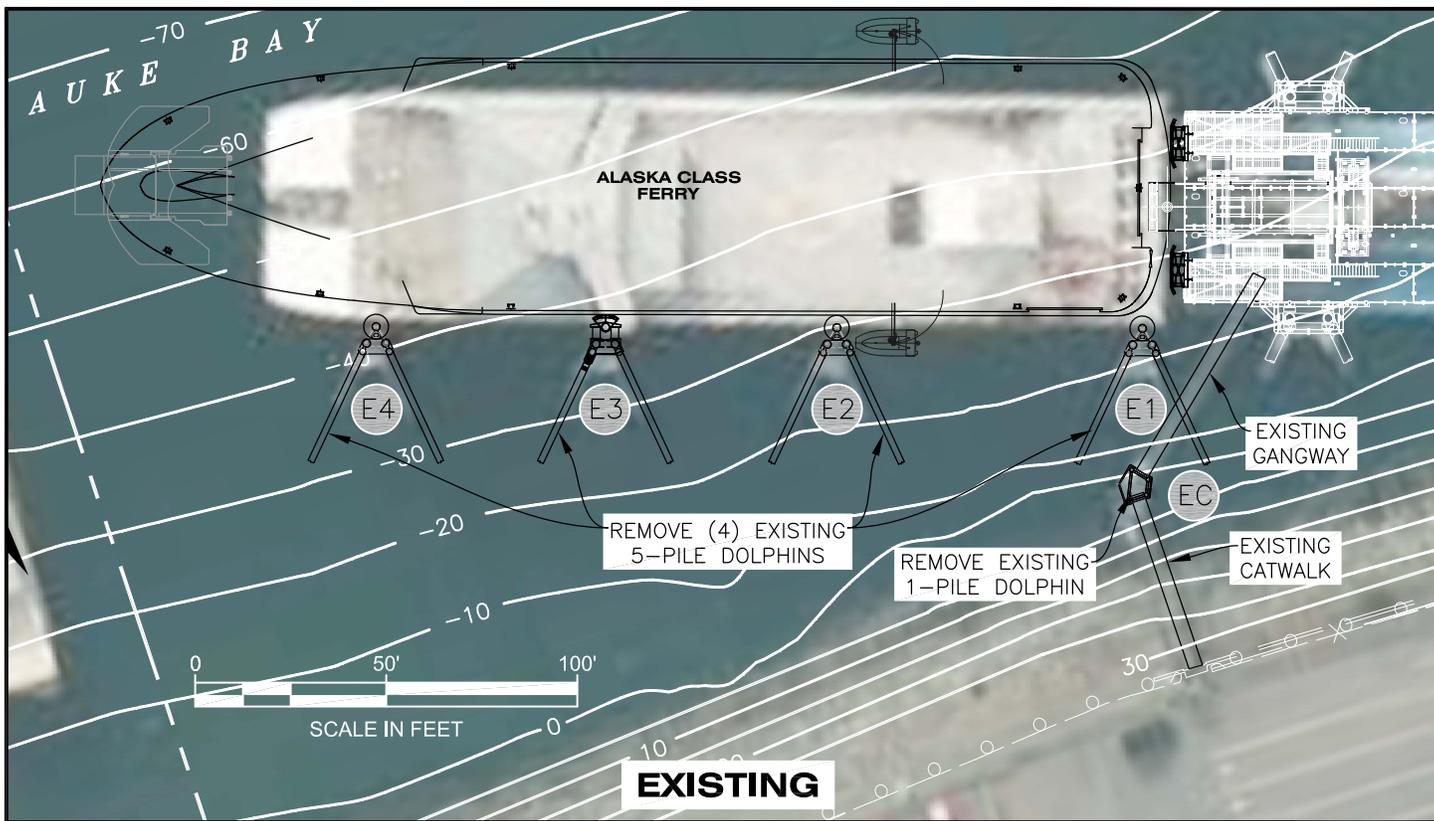
SUMMARY OF WORK

1 REPLACE (4) EXISTING 5-PILE FLOATING FENDER DOLPHINS E1-E4 & (1) EXISTING 1-PILE DOLPHIN EC AT STERN BERTH WITH (3) 4-PILE DOLPHINS E1-E3 & (2) 3-PILE DOLPHINS EC & E4. ALSO INCLUDES MISC. RETROFIT & CONSTRUCTION MODIFICATIONS FOR HOME PORT OF ALASKA CLASS FERRY.

ALASKA STATE DEPT. OF TRANSPORTATION AND PUBLIC FACILITIES
 DESIGN & ENGINEERING SERVICES DIVISION
 SOUTHCOAST REGION

SITE PLAN

JUNEAU, AK
 AUKE BAY FT MODIFICATIONS & IMPROVEMENTS
 DATE: JAN. 2019 SHEET **2** OF **4**



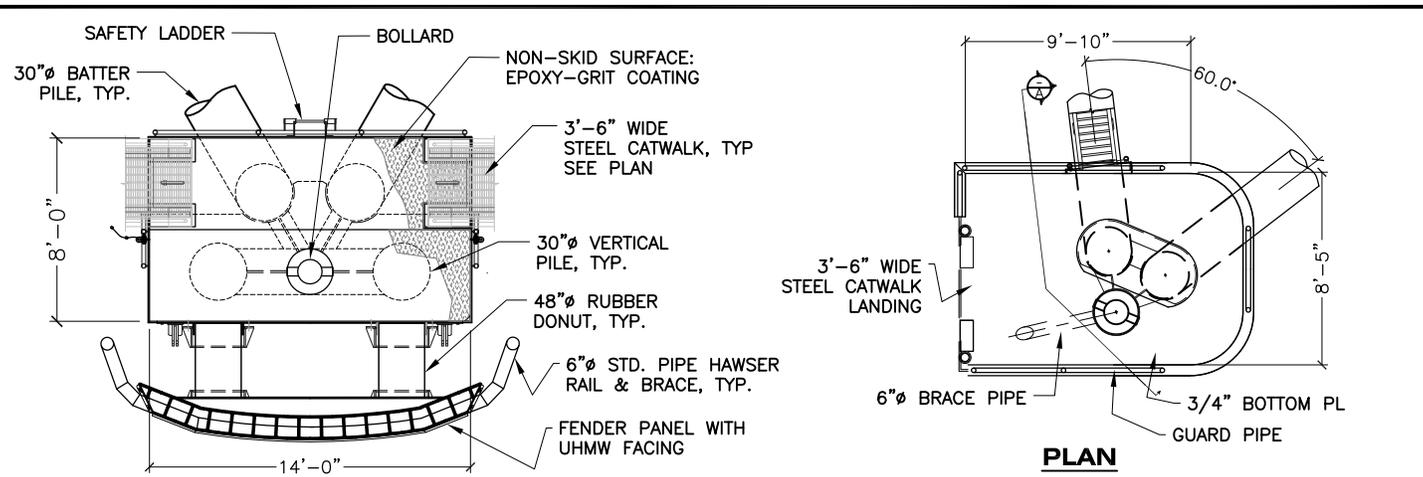
ALASKA STATE DEPT. OF TRANSPORTATION
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DESIGN & ENGINEERING SERVICES DIVISION
SOUTHCOAST REGION

EXISTING & PROPOSED LAYOUTS

JUNEAU, AK

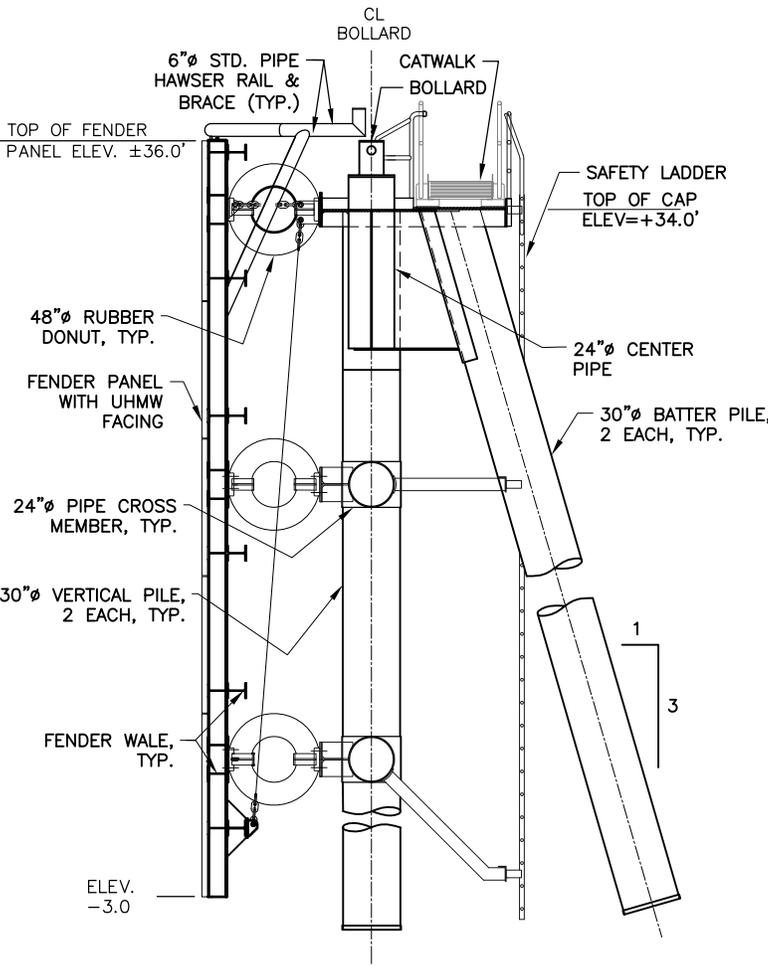
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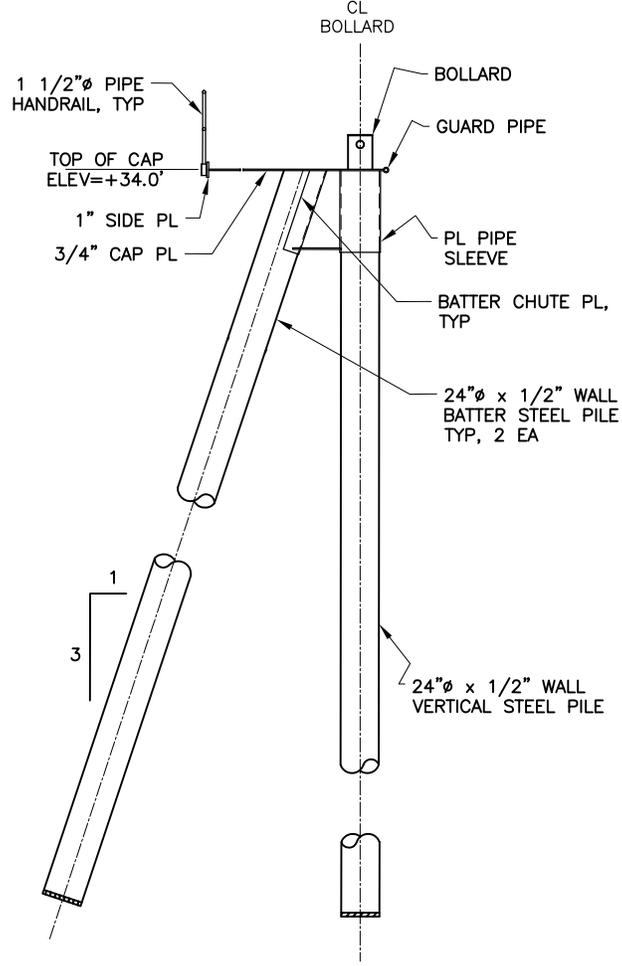


PLAN

PLAN



**SIDE ELEVATION
DOLPHINS E1, E2, E3**



**SECTION A-A
DOLPHINS EC, E4**

ALASKA STATE DEPT. OF TRANSPORTATION
AND PUBLIC FACILITIES
DESIGN & ENGINEERING SERVICES DIVISION
SOUTHCOAST REGION

TYPICAL DOLPHINS

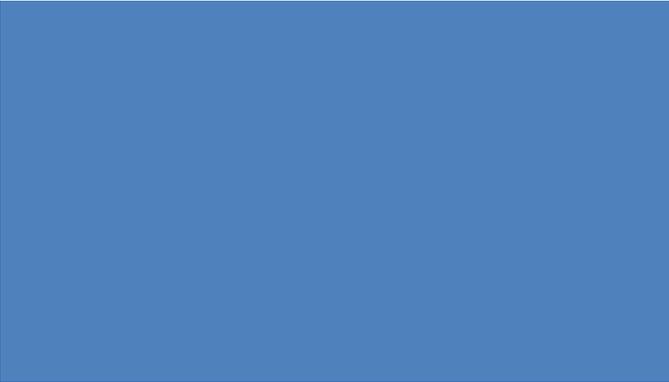
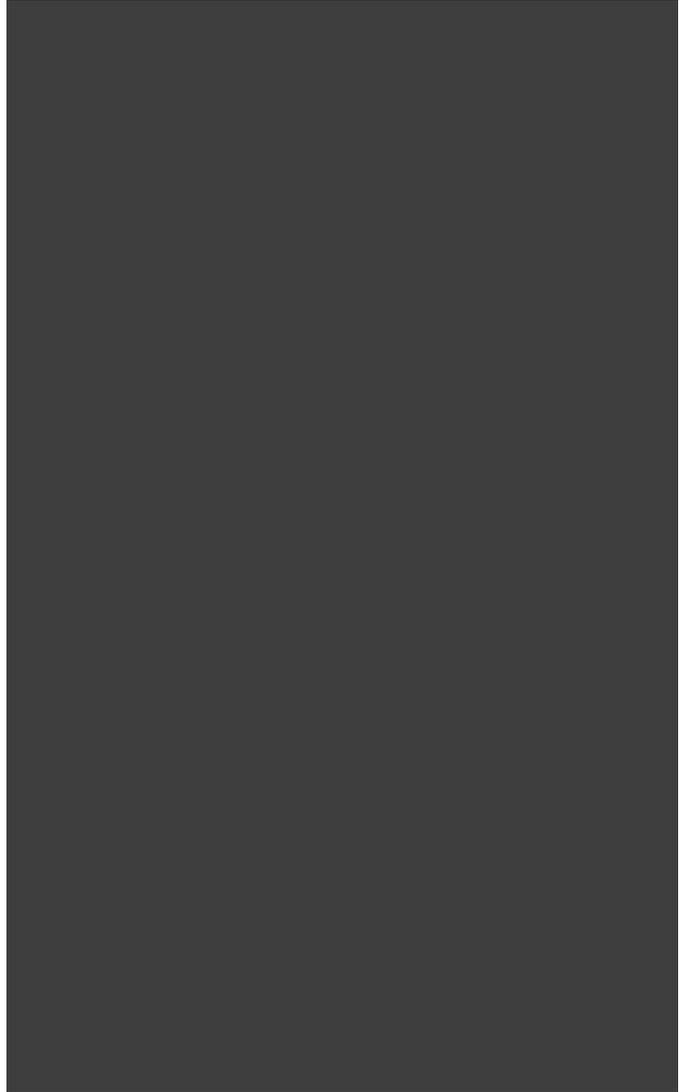
JUNEAU, AK
AUKE BAY FT MODIFICATIONS
& IMPROVEMENTS
DATE: JAN. 2019 SHEET **4** OF **4**

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Appendix B

Marine Mammal Monitoring and Mitigation Plan

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Prepared for:
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Attachments

Attachment 1: Example Data Forms



Acronyms and Abbreviations

DOT&PF	Alaska Department of Transportation and Public Facilities
FR	<i>Federal Register</i>
IHA	Incidental Harassment Authorization
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
PSO	Protected Species Observer

1.0 INTRODUCTION

The Alaska Department of Transportation and Public Facilities (DOT&PF) will implement the following Marine Mammal Monitoring and Mitigation Plan during pile installation and removal for the Auke Bay Ferry Terminal as part of the Auke Bay Ferry Terminal Modifications and Improvements Project (Project) in Auke Bay, Alaska. This Marine Mammal Monitoring and Mitigation Plan was prepared as part of the application for an Incidental Harassment Authorization (IHA) under the Marine Mammal Protection Act (MMPA), and in support of formal consultation with the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act.

The in-water portion of the Project includes removal of the four existing dolphins and construction of three 4-pile breasting dolphins and two 3-pile mooring dolphins. It is anticipated that a maximum of 13.5 hours of vibratory pile installation will occur and a maximum of 10.5 hours of vibratory removal will occur. The Project has the potential to generate elevated levels of underwater noise that could exceed Level A (injury) and Level B (disturbance) harassment thresholds established by NMFS under the new Technical Guidance (NMFS 2016) and the interim criteria (70 *Federal Register* [FR] 1871-1875), respectively.

Level A harassment is any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild. Level B harassment is any act of pursuit, torment, or annoyance that 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, but that does not have the potential to injure a marine mammal or marine mammal stock in the wild.

Steller sea lions (*Eumetopias jubatus*), harbor seals (*Phoca vitulina*), harbor porpoises (*Phocoena phocoena*), Dall's porpoises (*Phocoenoides dalli*), killer whales (*Orcinus orca*), minke whales (*B. acutorostrata*), and humpback whales (*Megaptera novaeangliae*) may occur in the Project area, and a small number of Level B takes was authorized for these marine mammals (see Project IHA). A small number of Level A takes was also authorized for harbor seals and harbor porpoises (see Project IHA).

This Marine Mammal Monitoring and Mitigation Plan describes the methods that have been developed to avoid, minimize, and mitigate potential harassment of marine mammals during pile installation and removal, and to monitor and record the extent of harassment if it does occur. All marine mammal monitoring must be conducted in compliance with the Project IHA, Biological Opinion, and Incidental Take Statement. If differences exist, the Project IHA, Biological Opinion, and Incidental Take Statement supersede this Marine Mammal Monitoring and Mitigation Plan.

2.0 AVOIDANCE AND MINIMIZATION MEASURES

The complete list of required avoidance, minimization, and mitigation measures can be found in the Project IHA. Avoidance and minimization measures described here include soft starts, establishment of Level A and Level B harassment zones, and marine mammal monitoring.

2.1 Soft Starts

Soft start procedures are detailed in the Project IHA. At the beginning of the work day or when pile installation activities have been stopped for longer than 30 minutes, soft start (ramping up) procedures will be implemented for impact pile installation. A soft start involves starting the equipment for brief durations to provide marine mammals in the vicinity of a construction site with an audible warning of impending noise, giving them the opportunity to leave the area before noise reaches the threshold of disturbance.

2.2 Harassment Zones

Shutting down pile installation or removal before a marine mammal crosses an acoustic isopleth into a defined Level A or Level B harassment zone will be used to avoid take. If a shutdown does not occur, the marine mammal will be considered a take upon entering the defined zone (Level A or Level B). All takes (potential exposures to defined sound levels) will be documented.

Distances to Level A and Level B harassment isopleths, as defined by NMFS, are listed in the Project IHA. Distances to Level B harassment thresholds vary by pile installation method, and pile size and type (see Project IHA). Distances to the Level A harassment thresholds vary by pile installation method, pile size and type, and the amount of time or number of strikes required for installation or removal (see Project IHA).

Shutdown zones (Table 2-1) will be used to avoid incidental Level A take of different marine mammal species. Level A shutdown zones differ by pile installation method and species functional hearing group and are listed in the Project IHA. Although every effort will be made to shut down before marine mammals enter the shutdown zones, if the Level A isopleth for a species is smaller than the defined shutdown zone, take of that species will not occur unless individuals enter their respective Level A harassment zones (see Project IHA).

Land forms are impenetrable by underwater noise and create shadows where noise from construction will not be audible. In Auke Bay, noise from vibratory and impact installation will be blocked from ensonifying some marine areas because those areas are located behind land forms. Marine waters will not be monitored if they are located behind landmasses such as islands, headlands, breakwaters, or causeways that block transmission of sound.

2.3 Marine Mammal Monitoring

To minimize impacts of Project activities on marine mammals, a minimum of two Protected Species Observers (PSOs) will be present during vibratory and impact pile installation and pile removal. PSOs will search for, monitor, document, and track marine mammals around and within the shutdown zones and Level B harassment zones (Figure 2-1 and Figure 2-2). It should be noted that the titles "Protected Species Observer" and "Marine Mammal Observer" are intended to be synonymous for consultation, documentation, and construction purposes.

2.3.1 Monitoring Overview

Pre-activity monitoring, monitoring during pile installation and removal, and post-activity monitoring must be conducted according to the descriptions in the Project IHA. PSOs will also implement the avoidance and minimization measures as specified in the Biological Opinion as issued from NMFS.

PSOs will begin observations of the appropriate harassment zones 30 minutes prior to the start of pile installation, and will continue to observe for 30 minutes after completion of pile installation, as described in detail in the Project IHA. During monitoring, PSOs will scan the water every few minutes with high-quality binoculars, and use the naked eye to scan during the remainder of the time. A high-powered spotting scope will also be available for scanning greater distances, so that any marine mammals swimming toward the harassment zones can be observed.

PSOs will have no other construction-related tasks or responsibilities while monitoring for marine mammals. Each PSO will be trained in marine mammal identification and behaviors, and provided with reference materials to ensure standardized and accurate observations and data collection.

Before construction commences, PSOs will meet with the Contractor and DOT&PF to determine the most appropriate observation location(s) for monitoring during pile installation and removal. If necessary, observations may occur from more than one location simultaneously. A primary PSO will always be placed at or near the terminal where pile installation and removal will occur. Other PSOs may be located at other observation locations as needed to adequately monitor the Level B harassment zones. Potential monitoring locations are identified in Figure 2-2, but additional public or private locations may be utilized with appropriate approvals. Selection of monitoring locations will include consideration of the following:

- Safety of the PSOs, construction crews, and other people present during construction,
- Ability to see the harassment zones and maximize field of view,
- Elevation and location, and
- Minimal interference with construction activities.

A clear authorization and communication system will be in place to ensure that both PSOs and the construction crew understand their respective roles and responsibilities. It is expected that if pile installation must be shut down to avoid take, the PSO will contact a designated member of the construction crew. PSOs and the construction manager will be equipped with a hand-held radio and/or phone, to ensure immediate communication of a shutdown. A “shutdown” is defined as a period of time when in-water noise from pile installation does not occur. All communications with the construction crew will be documented in the environmental conditions and construction activities log. Although it is the role of the PSOs to watch for marine mammals, DOT&PF construction personnel will be instructed to notify the PSOs immediately if they observe a marine mammal.

Specific aspects and protocols of marine mammal observations will also include the following:

- Monitoring distances will be measured with range finders.
- Distances to marine mammals will be based on the best estimate of the PSO, relative to known distances to objects in the vicinity and the use of the range finder.

- Bearings to marine mammals will be determined by using a compass.

2.3.2 Protected Species Observer Qualifications

PSO qualifications are described in the Project IHA. At a minimum, all PSOs must be capable of spotting and identifying marine mammals and documenting applicable data during all types of weather, including rain, sleet, snow, and wind. All PSOs must also be comfortable with handling the authority to stop work when necessary.

Qualifications include:

- Visual acuity (correction is permissible) sufficient to allow detection and identification of marine mammals at the water's surface. Use of binoculars may be necessary to correctly identify the target to species.
- Demonstrated ability to conduct field observations and collect data according to assigned protocols (this may include academic training), including the ability to use a range finder and compass accurately to determine distances and directions to marine mammals.
- Experience or training in field identification of marine mammals. Sufficient training, orientation, or experience with construction operations to provide for personal safety during observations.
- Ability to communicate orally, by radio or in person, with Project personnel about marine mammals observed in the area.

2.4 Data Collection

2.4.1 Environmental Conditions and Construction Activity

Data collection and reporting are described in the Project IHA. The PSOs will also document environmental conditions, types of construction activities, types of nearby commercial activities, and communications with the construction crew in the environmental conditions and construction activities log. Environmental conditions will be documented at the beginning and end of every monitoring period and at every half hour, or as conditions change. Any nearby commercial activities that could influence marine mammal behavior will be documented at the time of a marine mammal sighting. These could include the presence and number of vessels offloading at the seafood processing facility or the number and type of vessels present. Data collected will also include the PSOs' names; location of the observation station; time of observation; wave height; wind speed; amount and position of glare; weather conditions; and visibility (Table 2-1).

The PSOs will document the time of startup as well as shutdown. The PSOs will also document the reason for stopping work, time of shutdown, and type of pile installation or other in-water work taking place. Additionally, all communications between a PSO and the construction crew will be documented.

Data collected regarding environmental conditions, marine mammal sightings, and mitigation measures will be entered into a spreadsheet. Each data entry will be checked for quality assurance and quality control. Upon request, the data will be submitted to NMFS along with the final monitoring report.



2.4.2 Sightings

Authorized take by species is detailed in the Project IHA. Each marine mammal sighting will be documented on a sighting form, which consists of a data page/table and a map of where the marine mammal was observed (Attachment 1). Alternatively, data can be collected using a laptop, tablet, or similar electronic device that is protected from wet weather. Regardless of the collection platform, data will consist of start and end times of each sighting; number of individuals; sex and age class, if possible; behavior and movement; distances from Project activities to the sighting; type of in-water activity at the time of sighting; and if and when Project activities were stopped in response to the sighting. Monitoring distances will be measured with range finders. PSOs will record if Level A and/or Level B take occurs, including the number of animals and species taken. To the extent practicable, the PSOs will record behavioral observations that may make it possible to determine if the same or different individuals are being taken as a result of Project activities over the course of a single day. While monitoring and tracking a sighting, PSOs will also continue to sweep the water with binoculars and the naked eye to identify other marine mammals potentially entering the area.



Table 2-1. Data Attributes and Definitions

Data Attribute	Attribute Definition and Units Collected
Start and End times of monitoring period	Time monitoring by PSOs began and ended, without interruption.
Environmental Conditions	
Weather conditions	Dominant weather conditions, collected every 30 minutes: sunny (S), partly cloudy (PC), light rain (LR), steady rain (R), fog (F), overcast (OC), light snow (LS), snow (SN)
Wind speed	In knots
Wind direction	From the north (N), northeast (NE), east (E), southeast (SE), south (S), southwest (SW), west (W), northwest (NW)
Wave height	Calm, ripples (up to 4 inches), small wavelets (up to 8 inches), large wavelets (up to 2 feet), small waves (up to 3 feet), moderate waves (up to 6 feet), large waves (up to 9 feet)
Cloud cover	Amount of cloud cover (0–100%)
Visibility	Maximum distance at which a marine mammal could be sighted
Glare	Amount of water obstructed by glare (0–100%) and direction of glare (from south, north, or another direction)
Tide	Predicted hourly data information gathered from National Oceanic and Atmospheric Administration will be available on site
Construction and Communication Activities	
Time of event	Time that construction activities and all communications between PSOs and construction crews take place
Type of construction activity	Type of construction activity occurring, including ramp up, startup, shutdown, and type of pile installation technique
Communication	Information communicated between PSOs and construction crew
Marine Mammal Sighting Data	
Time of initial and last sighting	Time the animals are initially and last sighted
Number of individuals	Minimum and maximum number of animals counted; record the count the PSO believes to be the most accurate
Sex and age, if possible	Generally, numbers of females with pups or calves
Initial and final heading	Direction animals are headed when initially and last sighted
In-water construction activities at time of sighting	Type of construction activities occurring at time of sighting
Distance from marine mammal to construction activities	Distance from marine mammal to construction activities at initial sighting, closest approach to activities, and final sighting
Commercial activities at time of sighting	Description of nearby commercial activities occurring at time of sighting, such as presence and number of vessels offloading at seafood processing facility dock, number and type of vessels nearby
Behavior	Behaviors observed, indicating the primary and secondary behaviors
Change in behavior	Changes in behavior; indicate and describe
Group cohesion	Orientation of animals within the group and the distance between animals

3.0 REPORTING

Reporting requirements are outlined in the Project IHA. A draft report will be submitted to NMFS within 90 calendar days of the completion of marine mammal monitoring. A final report will be prepared and submitted to NMFS within 30 days following receipt of comments on the draft report from NMFS.

The monitoring report will include a description of the monitoring protocol, a summary of the data recorded during monitoring, and an estimate of the number of marine mammals that may have been harassed, including the total number extrapolated from observed animals across the entirety of relevant monitoring zones. The data will include:

- Numbers of days of observations
- Lengths of observation periods
- Locations of observation station(s) used and dates when each location was used
- Numbers, species, dates, group sizes, and locations of marine mammals observed
- Distances to marine mammal sightings, including closest approach to construction activities
- Descriptions of observable marine mammal behavior in the Level A and Level B harassment zones
- Times of shutdown events, including when work was stopped and resumed due to the presence of marine mammals or other reasons
- Descriptions of the type and duration of any pile installation work occurring and soft start procedures used while marine mammals were being observed
- Details of all shutdown events and whether they were due to the presence of marine mammals, inability to clear the hazard area due to low visibility, or other reasons
- Tables, text, and maps to clarify observations

An electronic copy of the data spreadsheet will be available to NMFS upon request.

If a marine mammal stranding is observed, NMFS or the U.S. Fish and Wildlife Service will be contacted immediately through the Alaska Marine Mammal Stranding Hotline (1-877-925-7773).



Figure 2-1. Shutdown Zones during Pile Installation and Removal at Auke Bay Ferry Terminal

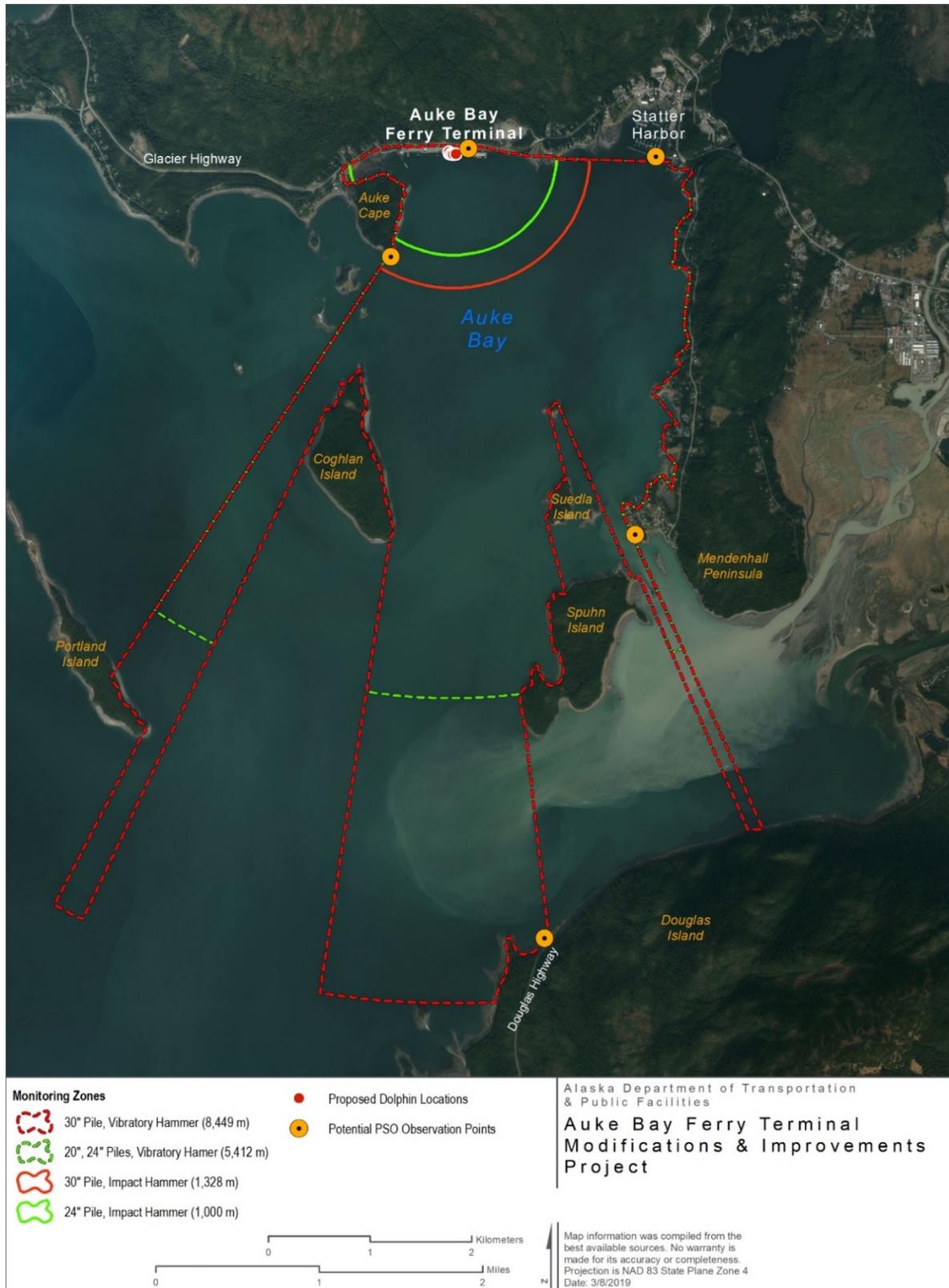


Figure 2-2. Level B Harassment Zones and Potential Monitoring Locations during Pile Installation and Removal at Auke Bay Ferry Terminal



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Attachment 1: Example Data Forms



Marine Mammal Sighting Form

Project: _____ **Location:** _____ **Sighting #:** _____
(1st sighting of the day is Sighting#: 1)

Date: _____ **Observer(s):** _____

Time <small>(military)</small>		Species <small>(circle)</small>	Distance <small>(animal to activity)</small>		Number of Animals		Number of Animals in Each Class <small>(if possible)</small>			
Initial Sighting Time		Steller Sea Lion	Initial Distance		Min Count		Adults		Calves/ Pups	
Final Sighting Time		Harbor Seal								
Time Entered H-Zone B		Harbor Porpoise	Closest Distance		Max Count		Juveniles		Unkn. Age	
Time Exited H-Zone B		Dall's Porpoise								
Time Entered H-Zone A		Killer Whale	Final Distance		Best Count		Male		Female	
Time Exited H-Zone A		Humpback								
		Fin Whale					Unknown Sex			
		Gray Whale								
		Minke Whale								
		other: _____								

Behavior of Marine Mammal check all observed behaviors; place a 1 next to primary, 2 next to secondary activity):
 Indicate any changes in behavior in the Additional Information section

<input type="checkbox"/> Travel	<input type="checkbox"/> Fight	<input type="checkbox"/> Mill	Other: _____
<input type="checkbox"/> Disoriented	<input type="checkbox"/> Play	<input type="checkbox"/> Dive	
<input type="checkbox"/> Slap	<input type="checkbox"/> Spyhop	<input type="checkbox"/> Unknown	
<input type="checkbox"/> Feeding Observed	<input type="checkbox"/> Swimming Toward	<input type="checkbox"/> Swimming Away from Site	

Group Cohesion (Orientation of animals within the group and the approx. distance between animals) :

Project Activities and Harassment Zone

Entered Harassment Zone A? **Y or N** Entered Harassment Zone B? **Y or N**

In-Water Work was occurring at initial sighting? **Y or N** List In-water Activities: _____

SHUT DOWN or DELAYED from _____ to _____ (time)

NO SHUT DOWN, EXPLANATION REQUIRED :

Describe Commerical Activities (# and type of vessels offloading at sea food processing dock, traveling by, refueling at dock):

Additional Information (include more detailed information on behavior):

Draw locations on hardcopy map

