

**Application for a Marine Mammal
Protection Act Incidental Harassment
Authorization**

Tenakee Springs Ferry Terminal Improvements Project

State Project # Z68145 / 0991006

**Submitted to:
National Marine Fisheries Service
Office of Protected Resources
1315 East-West Highway
Silver Spring, Maryland 20910-3226**

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Prepared for:
Alaska Department of Transportation and Public Facilities
6860 Glacier Highway
Juneau, Alaska 99801

Prepared by:
HDR
2525 C Street, Suite 500
Anchorage, AK 99503

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Appendices

Appendix A: Marine Mammal Monitoring and Mitigation Plan



Acronyms and Abbreviations

AMHS	Alaska Marine Highway System
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
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FR	<i>Federal Register</i>
Hz	Hertz
IHA	Incidental Harassment Authorization
kHz	kilohertz
km ²	square kilometers
LOA	Letter of Authorization
µPa	microPascals
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



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1 DESCRIPTION OF ACTIVITIES

1.1 Introduction

The Alaska Department of Transportation and Public Facilities (DOT&PF) requests an Incidental Harassment Authorization (IHA) for the take of small numbers of marine mammals incidental to construction associated with improvements to the Tenakee Springs Ferry Terminal in Tenakee Springs, Alaska, referred to as the Tenakee Springs Ferry Terminal Improvements Project (Project; State Project Number Z681450000). The DOT&PF requests that the IHA be valid for 1 year, from 01 June 2019 through 31 May 2020.

The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) regulations governing the issuance of 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. Types of Incidental Taking Authorization Requested
6. Take Estimates for Marine Mammals
7. Description of Potential Impacts of the Activity
8. Description of Potential Impacts on Subsistence Uses
9. Description of Potential Impacts on Habitat
10. Description of Potential Effects of Habitat Impacts on Marine Mammals
11. Mitigation Measures
12. Arctic Subsistence Plan of Cooperation
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

The Tenakee Springs Ferry Terminal is located in Tenakee Springs, Alaska, on Chichigof Island in southeast Alaska (Figure 1-1). The facility is a multi-function dock and active ferry terminal located in the center of town (Figure 1-2 and Figure 1-3). The existing structure is in need of modifications, as it is nearing the end of its operational life due to corrosion and wear. The purpose of the Project is to replace the existing, aging mooring and transfer structures with modern facilities that provide improved operations for Alaska Marine Highway System (AMHS) ferry vessels, as well as freight and fueling operators, servicing the community of Tenakee Springs. Planned improvements include the installation of new and renovation of existing shoreside facilities and marine structures to accommodate cargo and baggage handling, vessel mooring, passenger and vehicle access gangways and re-establishment of existing electrical and fuel systems. Improvements will enhance public safety and security.

Planned improvements will not add any additional berths for vessels, and the existing capacity of the facilities will not be increased.

The new facility will continue to serve as the AMHS ferry terminal and will also support shipping and receiving of commercial and service-industry goods. Given the lack of road access to Tenakee Springs, the ferry terminal is an essential component of infrastructure, providing critical access between Tenakee Springs and the rest of the region.

The Project includes the following components:

- Removal and replacement of the existing 12-foot by 240-foot approach dock decking and installation of additional steel pipe support piles,
- Removal of the existing city storage and fuel building and pile-supported dock and timber fender piles,
- Removal of the existing steel gangway float, platform, and associated steel pipe piles, and
- Removal of three, three-pile berthing and mooring dolphins.

The Project will also include the installation of:

- A 50-foot by 70-foot pile-supported ferry staging dock,
- A 50-foot by 60-foot pile-supported dock with new fuel building and associated dock mounted fender system,
- An 11-foot by 90-foot steel transfer bridge and pile-supported abutment,
- A steel bridge support float with adjustable intermediate ramp and apron with two, four-pile float restraint dolphins,
- Four, four-pile berthing dolphins, and
- A ferry access skiff float and associated steel pipe pile restraints.

Proposed activities included as part of the Project with potential to affect marine mammals include vibratory, impact, and drilling pile installation operations, and vibratory pile removal. 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). Proposed Project activities are described in detail in the following sections.

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.



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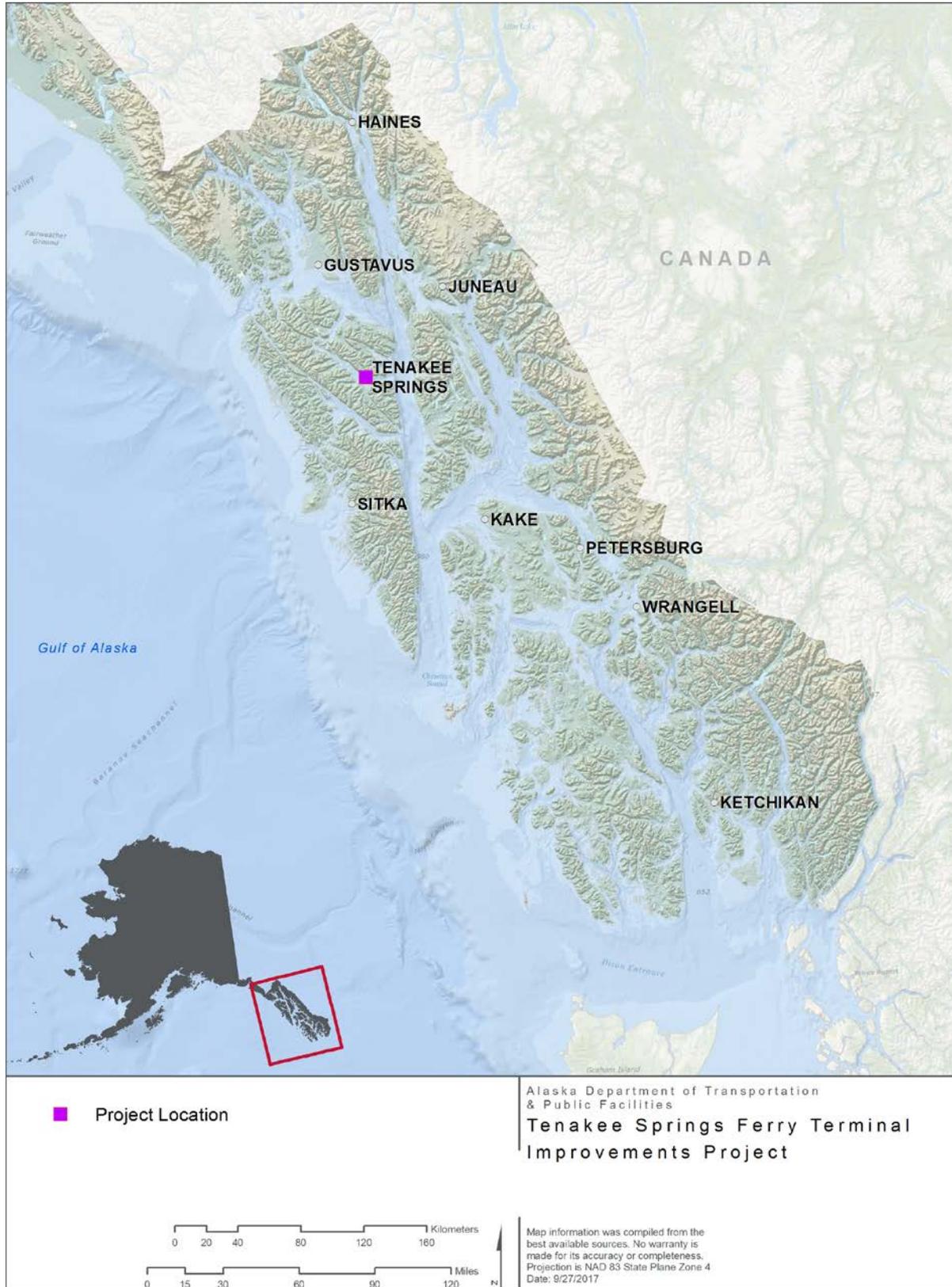


Figure 1-1. Site location and vicinity



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Figure 1-2. Tenakee Springs area



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Figure 1-3. Existing Tenakee Springs Ferry Terminal located on the north shore of Tenakee Inlet

Note: The replacement ferry terminal will be constructed in the same location.
(Source: ShoreZone, NOAA Alaska Fisheries)

1.3 Project Activities

The proposed action for this IHA request includes vibratory, impact, and drilling pile installation operations, and vibratory pile removal for the various aspects of the Project (Figure 1-4). These in-water activities could result in harassment to marine mammals as defined under the MMPA due to elevated sound levels.

There will be no dredging or removal of substrate, nor any deposition of fill or armor rock associated with the Project. Above-water construction will consist of the installation of concrete platform decking panels, utility lines, and a fuel building. The installed utility lines and pipelines will be connected to the platform, above marine waters, and no in-water noise is anticipated in association with their installation.

1.3.1 Removal of Old Piles

The Project will require the removal of approximately 84 piles of varying sizes and materials (Table 1-1). Not all existing structures and piles will be removed (Figure 1-4). It is anticipated that, when possible, existing piles will be extracted by directly lifting them with a crane. A vibratory hammer will be used only if necessary to extract piles that cannot be directly lifted. Removal of each old pile is estimated to require no more than 15 minutes of vibratory hammer use.



Table 1-1. Pile details and estimated effort required for pile removal

Pile Diameters & Material	Project Component	Number of Piles	Total Number of Piles	Vibratory Duration Per Pile (min)	Estimated Total Number of Hours	Number of Piles Per Day (Range)	Days of Removal
12.75-inch Steel Piles	Approach Dock	2	2	15	0.5	2	1
14-inch Timber Piles	City Dock Fender Piles	33	42	15	10.5	5-10	9
	City Storage Building Dock	9					
14-inch Steel Piles	City Dock	14	26	15	6.5	5-10	6
	Berthing Dolphin Fenders	12					
16-inch Steel Piles	Berthing Dolphins	9	9	15	2.25	5-10	2
18-inch Steel Piles	Steel Float	5	5	15	1.25	5	1
Totals			84		21		19

1.3.2 Installation of New Piles

The Project will require the installation of 121 piles of varying sizes and materials (Table 1-2). Tension anchors will be installed in 86 of the 121 total piles. Initial installation of steel piles through the sediment layer may be done using vibratory methods for up to 15 minutes per pile. If the sediment layer is very thin, instead of vibratory methods, a few strikes from an impact hammer may be used to seat some steel piles into the weathered bedrock before drilling begins. It is possible that only an impact hammer and drilling will be used for some piles, and only a vibratory hammer and drilling will be used for other piles, depending on sediment conditions and as decided by the construction contractor. Following initial pile installation, the mud accumulation on the inside of the pile will be augered out (or cleaned through another method), as necessary. Next, a hole (rock socket) will be drilled in the underlying bedrock by using a down-hole hammer (Figure 1-5). A down-hole hammer is a drill bit that drills through the bedrock and a pulse mechanism that functions at the bottom of the hole, using a pulsing bit to break up the rock to allow removal of the fragments and insertion of the pile. The head extends so that the drilling takes place below the pile. Drill cuttings are expelled from the top of the pile as dust or mud and allowed to settle at the base of the pile. It is estimated that drilling piles through the layered bedrock will take about 2–3 hours per pile.

Drilling will create a 10-foot-deep bedrock socket that holds the pile in place. The bedrock will attenuate noise production from drilling and reduce noise propagation into the water column. Additionally, the casing used during drilling acts like a cofferdam and will block noise, further reducing noise levels (82 *Federal Register* [FR] 34632; proposed IHA for the Gary Paxton



Industrial Park Dock Modification Project in Sitka, Alaska). However, noise levels from drilling the bedrock socket to support piles will likely exceed the 120 decibel (dB) root mean square (rms) threshold for Level B harassment from continuous noise (Section 6.2.2) during at least a portion of the drilling.

If necessary after drilling, no more than 30 blows from an impact hammer will be used to confirm that piles are set into bedrock (proofed). Proofing will require approximately 5–10 minutes per pile.

Tension anchors will be installed on 86 of the 121 steel piles. In general, the farthest seaward piles will utilize tension anchors. To anchor each pile following pile installation, a 10-inch casing will be inserted into the center of the pile and an 8-inch rock anchor drill will be lowered into the casing and used to drill into bedrock. Rock fragments will be removed through the top of the casing as dust or mud. Finally, the drill and casing will be removed, and an anchor attached by an anchor rod will be inserted into the hole. The hole will be filled with grout, which will harden, thereby encapsulating the anchor in the bore hole and securing the pile and anchor to bedrock. Once installed, tension anchors are tightened, applying tension to the pile to prevent movement within the rock socket. Eight of the tension anchors will be passive, which means they will not be tightened. This will provide the pile with a small amount of play, which will allow the pile to move until it meets the extent of the tension anchor.

Drilling for anchors takes place below the 10-foot-deep bedrock socket that holds the pile in place, and the bedrock serves to attenuate noise production from drilling activity and reduce noise propagation into the water column. Additionally, the casing acts like a cofferdam and will block noise; therefore, anchor drilling will result in low levels of in-water noise that do not approach injury or harassment levels for marine mammals (82 FR 34632; proposed IHA for the Gary Paxton Industrial Park Dock Modification Project in Sitka, Alaska). No take for harassment of marine mammals from anchor drilling is requested.

Installation of timber piles will use only an impact hammer, and will require approximately 75 strikes per pile, or approximately 20–30 minutes to install each pile.

Pile installation activities will occur in waters from 0 to 36 feet (0 to 11 meters) deep within or immediately adjacent to the existing dock footprint. It is anticipated that an ICE model vibratory driver or equivalent hammer and a Delmag D30 or Vulcan impact hammer, or equivalent hammer will be used to install the piles.



Table 1-2. Pile details and estimated effort required for pile installation

Pile Diameters & Material	Project Component	Number of Piles	Total Number of Piles	Vibratory Duration Per Pile (min)	Drilling Duration Per Pile ^a (min)	Impact Strikes Per Pile	Estimated Total Number of Hours	Number of Piles Per day (range)	Days of Installation
24-inch Steel Piles	City Dock	22	46	15	120	30	107	2-3	23
	Ferry Staging Dock	20							
	Transfer Bridge Abutment	4							
30-inch Steel Piles	Float Restraints (Vertical)	4	20	15	180	30	67	2-3	10
	Berthing Dolphins (Battered)	8							
	Berthing Dolphins (Vertical)	8							
20-inch Steel Piles	Float Restraints (Battered)	4	4	15	180	30	13	2-3	2
18-inch Steel Piles	Approach Dock	8	21	15	120	30	49	2-3	11
	Berthing Fenders	10							
	Skiff Float	3							
14-inch Timber Piles	Boat Moorage Fenders	30	30	NA	NA	75	10	5-10	6
8-inch Tension Anchors	Tension Anchors	78	86 ^b	NA	60	NA	86	4-8	22
	Passive Tensions Anchors	8							
Totals			121				332		74

^a All 91 steel piles will require drilling.

^b Tension anchors will be installed in a subset of piles and therefore are not included in the total number of piles.

1.4 Project Schedule

In-water Project construction activities will begin no sooner than 01 June 2019. Pile installation and removal is expected to be completed in 93 working days within a 4-month window beginning sometime after 01 June 2019. Pile installation will be intermittent and staggered depending on weather, construction and mechanical delays, marine mammal shutdowns, and other potential delays and logistical constraints. Given the possibility of schedule delays and other unforeseen circumstances, an IHA is being requested for a full year, from 01 June 2019 through 31 May 2020.

1.5 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
- USACE Section 404 of the Clean Water Act (CWA)
- Section 401 of the CWA
- NMFS Endangered Species Act (ESA) Section 7 Consultation

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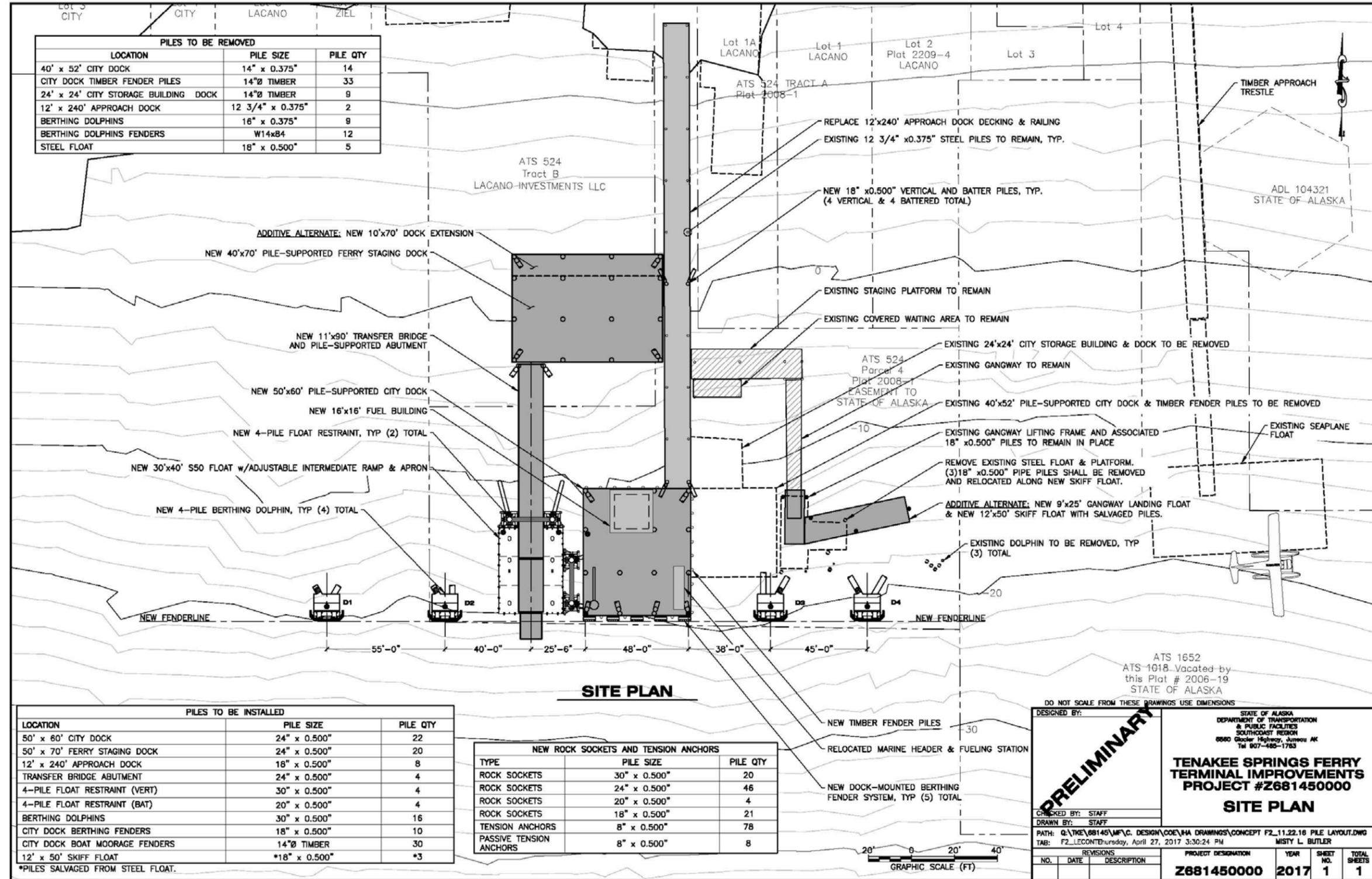


Figure 1-4. Tenakee Springs Ferry Terminal Improvements Project Site Plan.

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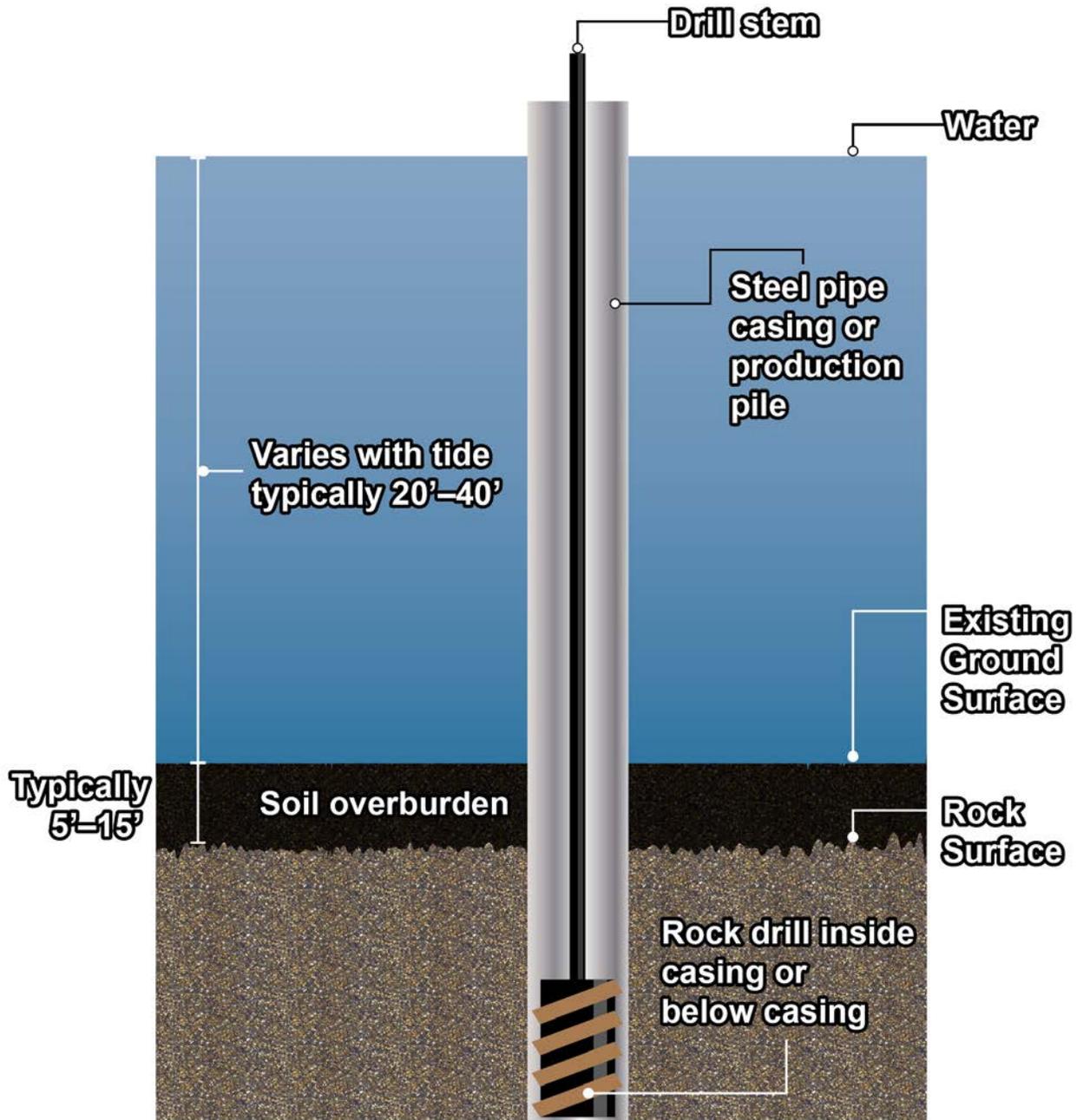


Figure 1-5. Down-hole Drilling Process for the Tenakee Springs Ferry Terminal Improvements Project.

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2 DATES, DURATION, AND GEOGRAPHICAL REGION OF ACTIVITIES

2.1 Dates and Durations of Activities

In-water work associated with the Project will begin on or after 01 June 2019 or immediately after authorization under the MMPA is granted. It is critical to DOT&PF that authorization for this Project is granted in an expedient manner to meet Project deadlines and avoid delays or interruptions in ferry and commercial services to Tenakee Springs. In-water work will be completed no later than 31 May 2020 (1 year following IHA issuance).

The Project will require approximately 93 days of pile installation and removal over a period of 4 months. This IHA requests authorization for up to 1 year of construction activities in case unforeseen construction delays occur. Pile installation will occur intermittently over the work period, for durations of minutes to hours at a time. Timing in both instances will vary based on weather delays, substrate type (the substrate is layered and is of varying hardness across the site, so some piles may take longer to install than others), and other factors. A production rate of one to three piles per day, on days when pile installation occurs, is considered typical for a project of this type. The exposure estimates provided in Section 6 are based upon the maximum estimates of days required for pile installation.

2.2 Geographical Setting

The Tenakee Springs Ferry Terminal is located in the City of Tenakee Springs, Alaska, at 57°46'45.6"N, 135°13'09.1"W, on Chichagof Island, on the north shore of Tenakee Inlet, in southeast Alaska (Figure 1-1 and Figure 1-2). Tenakee Springs is part of the Hoonah-Angoon Census Area. In 2016, there were an estimated 130 residents of Tenakee Springs. It is the second largest city on Chichagof Island.

2.2.1 Physical Environment

The Tenakee Springs Ferry Terminal is an active ferry terminal located in Tenakee Inlet and provides the primary access point to the City of Tenakee Springs. Improvements and new construction will take place in the same location as the existing dock. A sea plane float is located immediately east of the ferry terminal and a small boat harbor is located approximately 700 meters east of the terminal (Figure 1-2).

The town of Tenakee Springs is located on the north side of Tenakee Inlet, about 16 kilometers (9.9 miles) west of where the Inlet opens to Chatham Strait. Tenakee Inlet is a long, narrow fjord with steep, rocky sides interspersed with extensive mudflats and intertidal zones. Water depths consistently reach 900 to 1,100 meters (2,950 to 3,600 feet) in the center of the Inlet, with at least one location deeper than 1,280 meters (4,200 feet). The shoreline is complex and meandering, interspersed with numerous coves, islands, and rocky outcroppings. Numerous rivers and creeks feed into the Inlet, contributing to the highly productive marine environment.

The Inlet supports abundant marine resources, including salmon, herring, crab, and shrimp. Marine mammals use the Inlet regularly (Section 4), attracted to the rich foraging grounds. Humpback whales are seen bubble feeding in summer, and harbor seals haul out on rocky islets around the area.

2.2.2 Acoustical Environment

Baseline background (ambient) sound levels in Tenakee Inlet are unknown. The areas around the existing ferry terminal are frequented by ferries, fishing vessels, and tenders; barges and tugboats; float planes; and other commercial and recreational vessels that use the small-boat harbor, City dock, and other commercial facilities. Estimated vessel and ambient noise levels within the Project area are further discussed in Section 6.3.3.

3 SPECIES AND ABUNDANCE OF MARINE MAMMALS

Tenakee Inlet supports many species of marine mammals, including pinnipeds and cetaceans. Common species include Steller sea lions (*Eumetopias jubatus*), harbor seals (*Phoca vitulina*), and humpback whales (*Megaptera novaeangliae*). Less common species include harbor porpoises (*Phocoena phocoena*), Dall’s porpoises (*Phocoenoides dalli*), killer whales (*Orcinus orca*), and minke whales (*Balaenoptera bonaerensis*). Pacific white-sided dolphins (*Lagenorhynchus obliquidens*), California sea lions (*Zalophus californianus*), and gray whales (*Eschrichtius robustus*) are known to occur in southeast Alaska, but are not known to occur in Tenakee Inlet and therefore are not considered further in this application.

This IHA application is requesting incidental take for potential underwater acoustic disturbance from pile installation activities for Steller sea lions, harbor seals, harbor porpoises, Dall’s porpoises, killer whales, minke whales, and humpback whales (Table 3-1). Descriptions of each species and their presence in the Project area are provided in Section 4.

Table 3-1. Marine mammals 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)	None	None	Common
	53,303 (Western DPS)	Depleted & Strategic	Endangered	Occasional
Harbor seal	7,210 (Glacier Bay/Icy Strait)	None	None	Common
Harbor porpoise	975 (Southeast Alaska)	Strategic	None	Occasional
Dall’s porpoise	83,400 (Alaska)	None	None	Uncommon
Killer whale (Orca)	2,347 (Eastern North Pacific Alaska Resident)	None	None	Occasional
	521 (West Coast Transient)	None	None	Uncommon
	290 (Eastern North Pacific Northern Resident)	None	None	Occasional
Minke whale	N/A (Alaska)	None	None	Uncommon
Humpback whale	10,103 (Central North Pacific)	Depleted & Strategic ^a	Endangered ^a	Common

^a In 2016, NOAA Fisheries revised the ESA listing for the humpback whale to identify 14 DPSs; MMPA designation is currently being reviewed for each DPS (81 FR 62260).

Sources: Humpback whale abundance estimates: Wade et al. 2016. Western DPS of Steller sea lion estimate: Sweeney et al. 2016. Eastern North Pacific Resident stock of killer whales: Towers et al. 2015. All other abundance estimates: Muto et al. 2017.

Note: DPS = Distinct Population Segment; ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act; N/A = Not Available

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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 FR 49204). Steller sea lions were subsequently partitioned into the western and eastern DPSs (west and east stocks) in 1997 (62 FR 24345). The eastern DPS remained classified as threatened until it was delisted in November 2013. The western DPS (those individuals west of 144° W longitude or Cape Suckling, Alaska) was upgraded to endangered status following separation of the DPSs, and it remains endangered today. Steller sea lions that inhabit southeast Alaska are overwhelmingly part of the eastern DPS; however, branded individuals from the western DPS have been spotted near the project area (see Section 4.1.2).

The western DPS of Steller sea lions declined approximately 75 percent from 1976 to 1990. Population declines in the Aleutian Islands and western Gulf of Alaska began in the early to mid-1980s and continued to decline at about 15 percent per year. Factors that may have contributed to this decline include (1) incidental take in fisheries, (2) legal and illegal shooting, (3) predation, (4) contaminants, (5) disease, and (6) climate change. Non-pup Steller sea lion counts at trend sites in the range of the western DPS increased 11 percent during 2000–2004. These counts were the first region-wide increases for the western DPS since standardized surveys began in the 1970s, and were due to increased or stable counts in all regions except the western Aleutian Islands. The current minimum population estimate for abundance of the western DPS in Alaska is 53,303 sea lions, based on aerial and ship surveys of pups and non-pups conducted in June and July 2015 (Sweeney et al. 2016). The current minimum abundance estimate for the eastern DPS of Steller sea lions is 41,638 total individuals (Muto et al. 2017).

NMFS has provided no direction regarding calculation of take for the western DPS for projects in the geographic range of the eastern DPS, but reports that an average of 917 individuals from the western DPS move into southeast Alaska annually (NMFS 2013). 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 western DPS individuals is higher to the north and west and lower toward the south and east. Cape Ommaney and Frederick Sound is considered the southern limit of the range of western DPS animals. NMFS (2013) also stated that it is not currently possible to estimate the number of western DPS animals that are present east of 144° W latitude (geographic boundary of eastern DPS) at any particular time. However, for the purposes of this application, it is assumed that of the approximately 41,638 Steller sea lions that may be present in southeast Alaska (Muto et al. 2017), 17.8 percent are from the western DPS (Fritz, L., pers. comm.).

The project area is not located in or near designated critical habitat for the western DPS of Steller sea lions. In southeast Alaska, critical habitat for the western DPS 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 Lull Point (50 CFR 226.202),

more than 35 miles (56 kilometers) Euclidean (i.e., straight-line) distance south of Tenakee Springs (Fritz et al. 2016c).

4.1.2 Presence in Project Area

Steller sea lions are known to occur within the Project area; however, systematic counts or surveys have not been completed throughout Tenakee Inlet. Therefore, the best information regarding sea lion abundance and distribution comes from anecdotal reports from local residents and extrapolations from nearby haulouts that have been regularly monitored. Anecdotal reports from an employee of the existing ferry terminal fuel dock indicate that sea lions are generally present only in the fall and winter. Reports of these anecdotal observations also suggest that as many as 10–20 may swim by on a winter day, although most feed at night when their herring prey tend to be near the water's surface (Wheeler, K., pers. comm.).

The closest Steller sea lion haulout to the project area is the Tenakee Cannery Point haulout, which is approximately 8.9 kilometers (4.8 nautical miles) east of the Project site (Fritz et al. 2016c; Figure 4-1). Recent summer counts have not recorded any Steller sea lions at this haulout, and historical counts between April and September have not exceeded 12 individuals during any survey (Fritz et al. 2016b). This haulout appears to be most active between October and March (Figure 4-2), which is consistent with anecdotal reports of sea lion abundance in the Project area (Rasanen, L., pers. comm.; Wheeler, K., pers. comm.). Non-pup counts conducted between October and March from 2004 to 2017 averaged 140 individuals and ranged from 0 to 330 (Jemison 2017, unpubl. data). Pups have not been counted at this haulout (Fritz et al. 2016a). In addition to those counted at the haulouts, as many as a few hundred more sea lions occur throughout Tenakee Inlet in small hunting groups (Rasanen, L., pers. comm.). The Point Marsden and Emmons haulouts are also located within 20 nautical miles of Tenakee Springs, but it is unlikely that individuals from those haulouts regularly inhabit Tenakee Inlet. Experts with the Alaska Fisheries Science Center of NMFS estimate that roughly 17.8 percent of the Steller sea lions at the Tenakee Cannery Point haulout are members of the western DPS (L. Fritz, pers. comm.; L. Fritz, unpublished data).

4.1.3 Life History

Steller sea lions are opportunistic predators, feeding primarily on a wide variety of fishes and cephalopods, including Atka mackerel (*Pleurogrammus monopterygius*), 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; Rehburg et al. 2009). The foraging habits of sea lions using the Tenakee Cannery Point haulout and throughout Tenakee Inlet are not well known, but it is reasonable to assume that they disperse in many directions to obtain food.

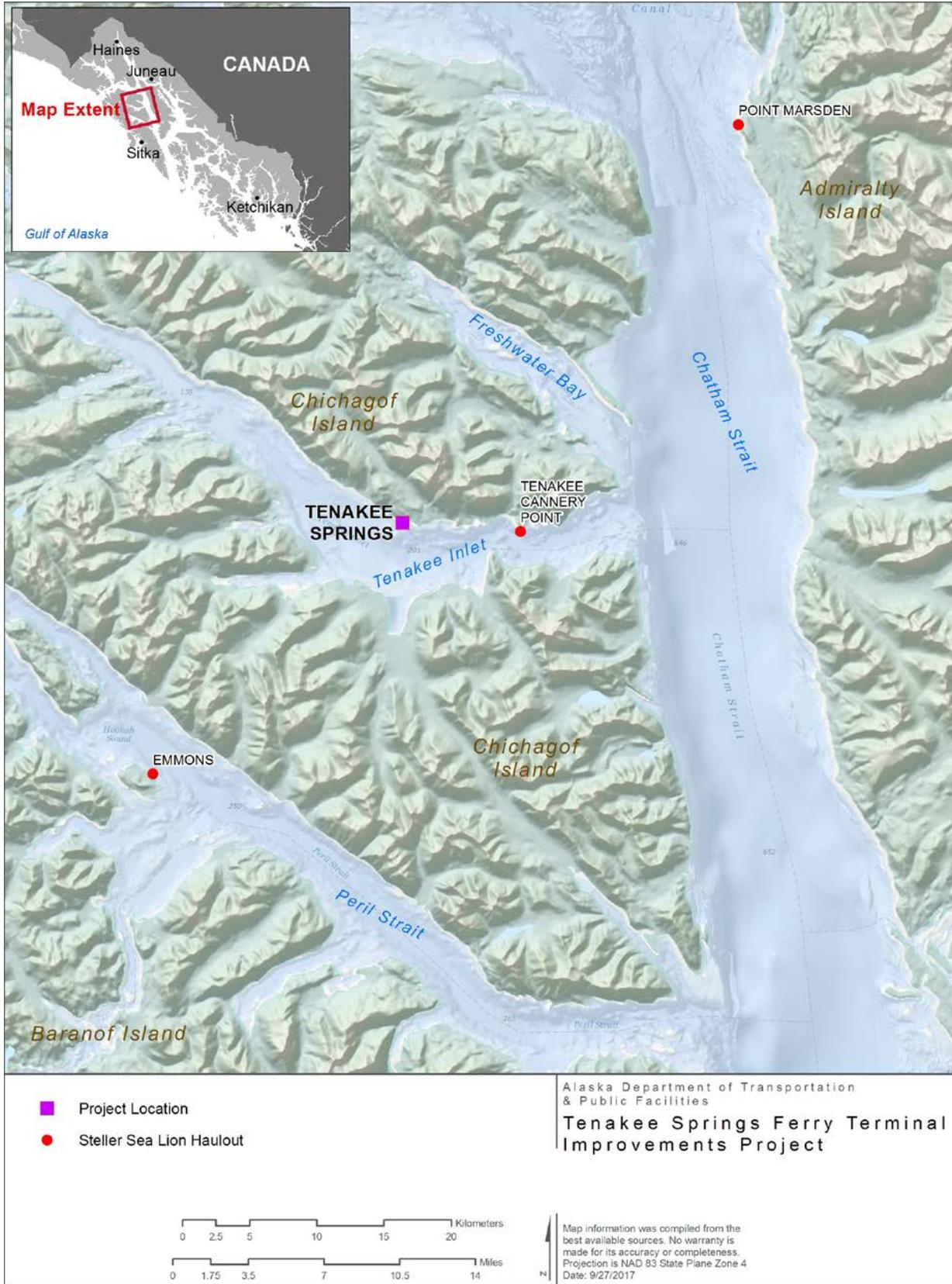


Figure 4-1. Steller sea lion haulouts located near Tenakee Springs

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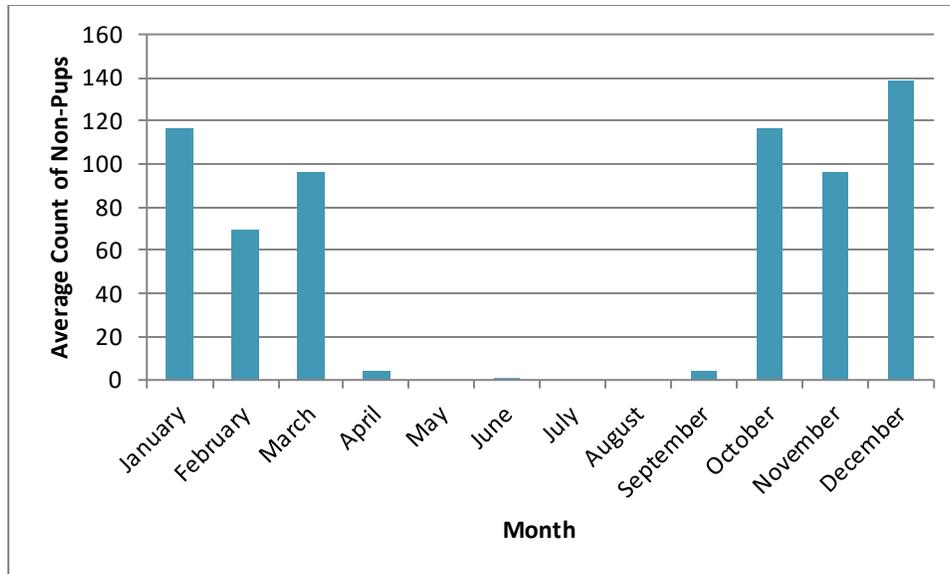


Figure 4-2. Average monthly Steller sea lion non-pup counts at Tenakee Cannery Point haulout, 1982–2015

(Source: Fritz et al. 2016b)

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 in Tenakee Inlet are members of the Glacier Bay/Icy Strait stock. The distribution of this stock extends from Cape Fairweather south to Column Point on the west and includes Glacier Bay, Icy Strait, Tenakee Inlet, and the western portion of Chatham Strait from Hanus Reef south to Tenakee Inlet (Muto et al. 2017).

Harbor seals are not designated as depleted under the MMPA and are not listed under the ESA, but like all 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 most recent abundance estimate for the Glacier Bay/Icy Strait stock is 7,210 individuals, based on surveys in 2011 (Muto et al. 2017). The stock added an estimated 179 seals per year between 2007 and 2011, and there is a probability of 0.40 that the stock will decrease (Muto et al. 2017).

4.2.2 Presence in Project Area

Survey data from 2003 through 2011 indicate that there are eight harbor seal haulouts in Tenakee Inlet and a number of others nearby in Chatham Strait and Freshwater Bay (Figure 4-3). The nearest haulout to the Project site is located on Tenakee Reef, near Tenakee Reef Light (a navigational and warning light for vessels), approximately 1 kilometer south of the ferry terminal. Anecdotal observations indicate that up to 200 harbor seals may haul out on the rocks

at and around the Tenakee Reef Light at any time of year (Rasanen, L., pers. comm.). Two additional harbor seal haulouts are located approximately 5.2 and 10.0 kilometers from the ferry terminal, on Strawberry Island and in Crab Bay, respectively.

Aerial haulout surveys conducted in August 2011 divide Tenakee Inlet into four survey units. The survey unit along the north shore of the Inlet, including the Project site, had a population estimate of 61 individuals. Other survey units in Tenakee Inlet had between 1 and 64 individuals. This information comes from a single year of surveys, and standard errors on these estimates are very high; therefore, confidence is low (London et al. 2015). Researchers estimate that the total abundance in Tenakee Inlet was approximately 259 seals in 2011 (London, J., pers. comm.).

Because harbor seals are non-migratory, we do not suspect that abundance fluctuates seasonally, but distribution throughout Tenakee Inlet and Chatham Strait likely fluctuates based on numerous environmental factors.

4.2.3 Life History

Harbor seals forage on fish and invertebrates (Orr et al. 2004), including capelin, eulachon, 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 is locally and seasonally abundant (Payne and Selzer 1989). Depending on prey availability, research has demonstrated that harbor seals conduct both shallow and deep dives during hunting (Tollit et al. 1997).

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).

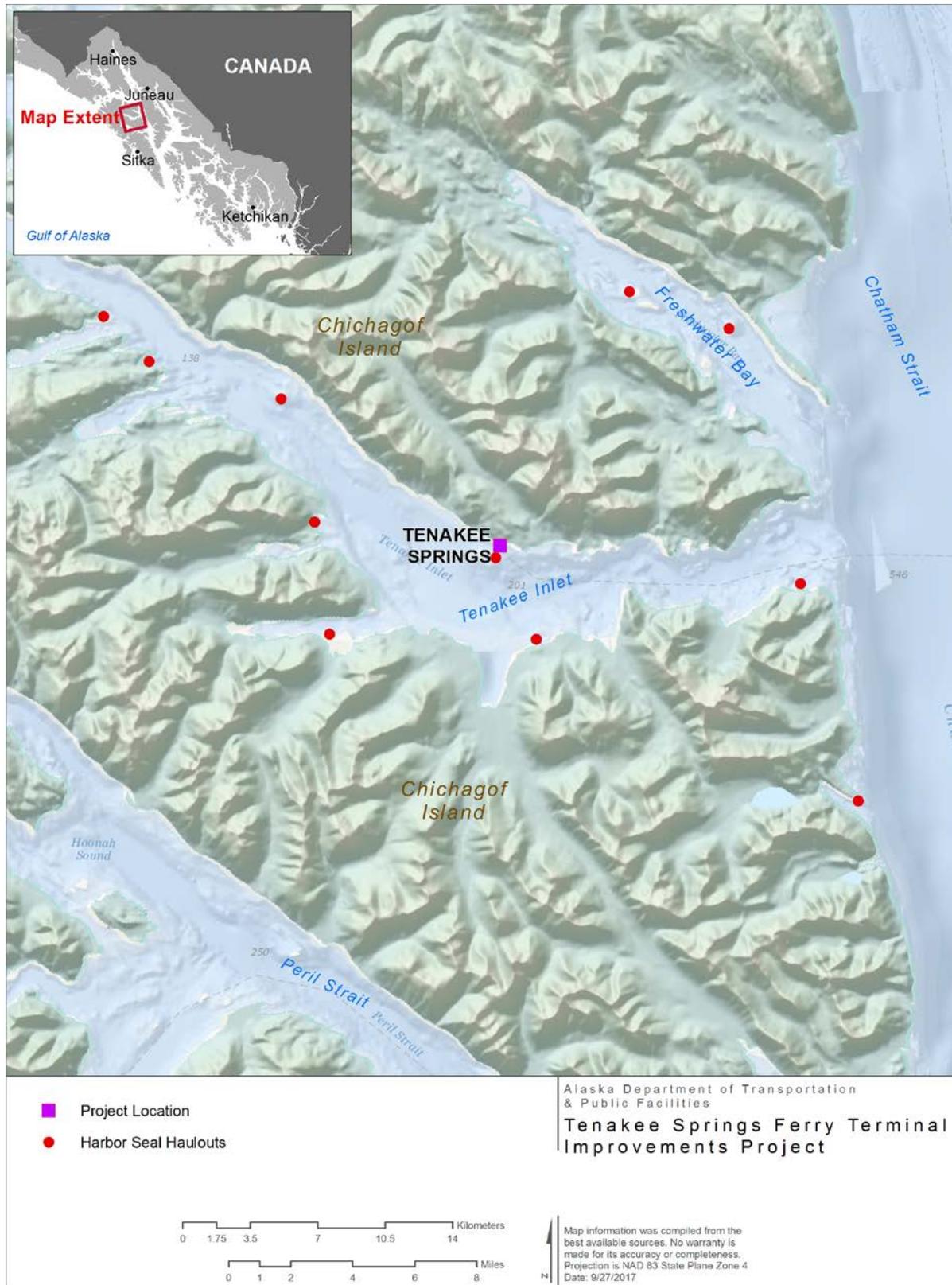


Figure 4-3. Harbor seal haulouts located near Tenakee Springs

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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 Canadian boundary (Muto et al. 2017). 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 (328 feet) 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 current minimum population estimate for harbor porpoises in the Southeast Alaska stock is 975 individuals, based on estimates completed in 1997 (Muto et al. 2017). No reliable information is available to determine trends in abundance.

4.3.2 Presence in Project Area

Information on harbor porpoise abundance and distribution in Tenakee Inlet has not been systematically collected. Anecdotal observations from marine mammal researchers indicate that harbor porpoise are seen a few times per month in groups of 3 to 5 individuals, but there is no seasonal trend to these observations (Dahlheim, M., pers. comm.). Harbor porpoise surveys conducted in southeast Alaska during the summers of 1991–1993, 2006, 2007, and 2010–2012 included Chatham Strait. The average density estimate for all survey years in Chatham Strait was 0.013 harbor porpoise per square kilometer (Dahlheim et al. 2015). Surveys in 1997, 1998, and 1999 reported average porpoise densities in southeast Alaska of 0.033 porpoise per square kilometer and an average group size of 1.3 individuals (Hobbs and Waite 2010).

4.3.3 Life History

Harbor porpoises forage in waters less than 200 meters (656 feet) 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. Harbor porpoises mate approximately 1.5 months after calving, with a gestation period of 10.5 months. Calves begin to forage on solid food within a few months of birth and are weaned before they are a year old (Bjørge and Tolley 2009).

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 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 prefer waters more than 600 feet (180 meters) deep (Jefferson 2009).

Dall's porpoises, like all marine mammals, are protected under the MMPA, but are 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. 2017).

4.4.2 Presence in Project Area

There currently is no information on the presence or abundance of Dall's porpoises in Tenakee Inlet. Local marine mammal experts indicate that the species is rarely seen near Tenakee Springs (Lewis, S., pers. comm.). Dall's porpoises likely occur more often in the deeper waters of Chatham Strait, although waters more than 600 feet (182 meters) deep are found within the central portion of Tenakee Inlet between Tenakee Springs and Chatham Strait (Figure 4-4). Average pod size in southeast Alaska ranges from 3 to 6 individuals (Dahlheim et al. 2009). Dall's porpoise commonly "bowride," or ride the wake created by large, relatively fast-moving vessels. It is possible that Dall's porpoises may bowride alongside a vessel into the Project area, but we would not expect individuals to stay for long periods or congregate in the Project area, nor to venture farther up Tenakee Inlet due to shallow water depths.

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 (Wade et al. 2003). Common prey includes a variety of small, schooling fishes (such as herrings, anchovies, mackerels, and sauries) 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). Dall's porpoises are susceptible to incidental bycatch in fishing gear such as drift nets, gillnets, and trawls.



Figure 4-4. Marine areas greater than and less than 600 feet deep near Tenakee Springs

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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. 2017). 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 southeastern 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. 2017). The Northern Resident stock occurs from Washington north through part of southeast Alaska and consists of 290 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. Dahlheim et al. (2009) noted a 5.2 percent annual decline in transient killer whales observed in southeast Alaska between 1991 and 2007.

4.5.2 Presence in Project Area

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).

Systematic surveys of killer whales in Tenakee Inlet have not been completed. Local marine mammal experts estimate that approximately two killer whale pods pass by Tenakee Springs each month (Lewis, S., pers. comm.). It is not known whether these are resident or transient whales.

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 6.0 in spring, 5.0 in summer, and 3.9 in fall. Pod sizes of transient whales are generally smaller than those of resident social groups. Resident killer whales occur in larger 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 21.54 in spring, 32.33 in summer, and 19.33 in fall (Dahlheim et al. 2009).

4.6 Humpback Whale

4.6.1 Status and Distribution

Humpback whales worldwide were designated as "endangered" under the Endangered Species Conservation Act in 1970, and were listed under the ESA at its inception in 1973. However, on 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 of all humpback whales in southeast Alaska and northern British Columbia are members of the Mexico DPS, while all others are members of the Hawaii DPS (Wade et al. 2016).

The DPSs of humpback whales that were identified through the ESA listing process do not necessarily equate to the existing MMPA stocks. The stock delineations of humpback whales under the MMPA are currently under review. Until this review is complete, NMFS considers humpback whales in southeast Alaska to be part of the Central North Pacific stock, with a status of endangered under the ESA and designations of strategic and depleted under the MMPA (Muto et al. 2017). The current estimate of population size for the Central North Pacific stock is 10,103 humpback whales (Muto et al. 2017).

Humpback whales experienced large population declines due to commercial whaling operations in the early twentieth century. Barlow (2003) estimated the population of humpback whales at approximately 1,200 animals in 1966. The population in the North Pacific grew to between 6,000 and 8,000 by the mid-1990s. Current threats to humpback whales include vessel strikes, spills, climate change, and commercial fishing operations (Muto et al. 2017).

4.6.2 Presence in Project Area

Humpback whales are found throughout southeast Alaska in a variety of marine environments, including open-ocean, near-shore 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, and there have been no systematic surveys of humpback whales in or near the Project area. Marine mammal experts in the region have indicated that there are as many as 12 humpbacks present in Tenakee Inlet from spring through fall. During the winter, they are less common, but are regularly present (S. Lewis and M. Dahlheim, pers. comm.).

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 the winter to breed, but rare events of over-wintering humpbacks have been noted, including known non-migratory individuals in Tenakee Inlet (S. Lewis, pers. comm.). It is thought that those humpbacks that remain in southeast Alaska do so in response to the availability of winter schools of fish prey (Straley 1990). 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).

4.7 Minke Whale

4.7.1 Status and Distribution

Minke whales, like all 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 severe population declines like larger cetaceans did. Minke whales are found throughout the northern hemisphere in polar, temperate, and tropical waters. There is a dwarf form of minke whale found in the southern hemisphere, and the subspecies of Antarctic minke whales are found around the continent of Antarctica. The International Whaling Commission has identified three 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 found throughout the eastern Pacific. NOAA further splits this third stock between Alaskan whales and resident whales of California, Oregon, and Washington (Muto et al. 2017). Minke whales are found in all Alaskan waters. There are no population estimates for minke whales in 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

Little is known about minke whale abundance and distribution in the Project area; there have been no systematic studies conducted in or near Tenakee Inlet. Surveys throughout southeast Alaska between 1991 and 2007 recorded minke whales infrequently, but noted a wide variety of habitat types used throughout all inland waters and little seasonal variation. During these surveys, the observation nearest to Tenakee Springs was in Chatham Strait, approximately 10 miles south of the mouth of Tenakee Inlet. Concentrations of minke whales were observed near the entrance to Glacier Bay. Most minke whales observed during the surveys were individual animals (Dahlheim et al. 2009).

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. In Alaska, seasonal movements are associated with feeding areas that are generally located at the edge of the pack ice (NMFS 2014).

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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 construction associated with improvements to the Tenakee Springs Ferry Terminal in Tenakee Springs, Alaska. The DOT&PF requests an IHA for incidental take of marine mammals described within this application for 1 year, commencing on 01 June 2019 (or the issuance date, whichever is later). The DOT&PF is not requesting an LOA at this time because the activities described herein are expected to be completed within 1 year from the date of authorization, and 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 from 01 June 2019 through 31 May 2020 for Level B take (behavioral harassment) of Steller sea lions, harbor seals, harbor porpoises, Dall's porpoises, killer whales, humpback whales, and minke whales that may occur during the Project. Steller sea lions, harbor seals, harbor porpoises, killer whales, and humpback whales are the marine mammal species most likely to be observed within the harassment zones (Section 6.5). Take is also being requested for species that are rarely observed within the calculated Level B isopleths but could occur in the area, including Dall's porpoises and minke whales. The request for a small number of takes for each species that is rarely 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.

The methodology described in Section 6 estimates potential noise exposures of marine mammals resulting from pile installation in the marine environment. Results from this approach tend to provide an overestimation of exposures because all animals are assumed to be available to exposure while piles are being installed, 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 15,626 potential exposures (see Section 6 for estimates of exposures by species) to pile installation/removal over the course of the Project that could be classified as Level B harassment as defined under the MMPA. The DOT&PF's mitigation measures for the Project (Section 11) include monitoring of mitigation zones prior to the initiation of pile installation, 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. These mitigation measures decrease the likelihood that marine mammals will be exposed to sound pressure levels that would cause harassment, although the amount of that decrease cannot be quantified. Implementation of a 100-meter shutdown zone (extended to 200 meters for short durations) during pile installation and removal will avoid Level A harassment of marine mammals.

The DOT&PF does not expect that all 15,626 potential exposures to Level B 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 Level B harassment of 15,626 marine mammals over the course of

1 year in this IHA application. As described in Section 6.5.1, most takes are expected to result from repeated exposures of a small number of individuals.

5.3 Method of Incidental Taking

Pile installation activities as outlined in Sections 1 and 2 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 by vibratory, drilling, and impact pile installation and/or removal. See Section 11 for more details on the impact reduction and mitigation measures proposed.

Detectable effects of the Project on marine mammal habitat are not expected (Section 9). Indirect effects to prey would be insignificant and discountable due to recolonization and the temporary nature of the activity, and are expected to be undetectable as well. The proposed 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 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 in Sections 1 and 2 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 activities 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 it 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.

Transmission loss is typically between 10 dB (cylindrical spreading) and 20 dB (spherical spreading), typically referred to as 10 log and 20 log, respectively. Cylindrical spreading occurs when sound energy spreads outward in a cylindrical fashion bounded by the bottom sediment and water surface, such as 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, 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 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 sound pressure level 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. Sound pressure level 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 Hz 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 Hz 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 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 any underwater objects in the area.

6.2 Applicable Noise Criteria

NMFS recently published updated Technical Guidance 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 sound sources (NMFS 2016b). This application uses the new Technical Guidance for assessing Level A harassment and uses the NMFS interim criteria for exposure of marine mammals to Level B harassment.

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

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

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 2016b). Under the new 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 PTS 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 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 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
 Source: NMFS 2016b.

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 impulse sounds (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 sounds (e.g., vibratory pile installation), the Level B harassment threshold is set at an SPL of 120 dB re 1 μ Pa rms.

6.3 Description of Noise Sources

Relative to other construction activities, pile installation and removal are anticipated to produce the highest in-water sound pressure levels. Vibratory hammers produce constant sound when operating, and produce vibrations that liquefy the sediment surrounding the pile, allowing it to penetrate the initial sediment layer. All steel piles will be inserted through the overlying sediment with a vibratory hammer. A vibratory hammer may also be used to remove timber and steel piles. For this Project, vibratory hammers will operate for about 15 minutes per pile.

In the Tenakee Springs Project area, a layer of bedrock underlies a thin sediment layer, which will necessitate drilling into the bedrock at least 10 feet to create a rock socket to hold in place all steel piles (Table 1-2), or approximately 91 of the 121 total piles. A down-hole hammer is a drill bit that drills through the bedrock and a pulse mechanism that functions at the bottom of the hole, using a pulsing bit to break up the harder materials or rock to allow removal of the fragments and insertion of the pile. The head extends so that the drilling takes place below the pile. Drill cuttings are expelled from the top of the pile as dust or mud. It is estimated that drilling piles through the layered bedrock will take about 2–3 hours per pile (Table 1-2).

If necessary, after each pile is seated in a bedrock socket, it will be proofed with about 30 strikes (about 5–10 minutes) from an impact hammer to ensure that it is seated properly. Timber piles will be installed using only an impact hammer, and require approximately 75 strikes per pile. An impact hammer is a steel device that works like a piston, producing a series of independent strikes to install or proof a pile. Impact hammering typically generates the loudest noise associated with pile installation.

Vessel noise will be generated by a tug and work barge, including at least one derrick barge with a mounted crane; see Section 6.3.3 for a discussion of noise levels associated with vessel activities.

6.3.1 Underwater Noise Levels

Pile Installation Noise Levels

The Project includes vibratory installation and impact proofing of steel pipe; impact installation of timber piles; vibratory removal of steel pipe and timber piles; and drilling of rock sockets into bedrock for steel piles (Table 6-3). Sound source levels (SSLs) for each type of activity were estimated using empirical measurements from similar projects in other areas, including projects in Alaska.

Table 6-3. Estimates of mean underwater sound levels generated during vibratory and impact pile installation, drilling, and vibratory pile removal

Method and Pile Type	Installation, Removal, or Proofing	Sound Level at 10 meters	Literature Source
Vibratory Hammer		dB rms	
30-inch steel piles	Install	165.0	Derived from Warner and Austin 2016a, Denes et al. 2016
24-inch steel piles	Install	161.0	Navy 2012, 2015
20-inch steel piles	Install	161.0	Navy 2012, 2015
18-inch steel piles	Remove, Install	161.0	Navy 2012, 2015
16-inch steel piles	Remove	161.0	Navy 2012, 2015
14-inch steel piles	Remove	155.0	MacGillivray et al. 2015
14-inch timber piles	Remove, Install	155.0	MacGillivray et al. 2015
12.75-inch steel piles	Remove	155.0	MacGillivray et al. 2015

Method and Pile Type	Installation, Removal, or Proofing	Sound Level at 10 meters			Literature Source
Drilling		dB rms			
30-inch steel piles	Install	165.0			Derived from Warner and Austin 2016b
24-inch steel piles	Install	165.0			Derived from Warner and Austin 2016b
20-inch steel piles	Install	165.0			Derived from Warner and Austin 2016b
18-inch steel piles	Install	165.0			Derived from Warner and Austin 2016b
Impact Hammer		dB rms	dB SEL	dB peak	
30-inch steel piles	Proofing	194.7	180.8	208.6	Warner and Austin 2016a
24-inch steel piles	Proofing	193.0	181.0	210.0	Navy 2015 (from 82 FR 31400)
20-inch steel piles	Proofing	186.5	175.5	207.0	Caltrans 2015
18-inch steel piles	Proofing	158.0	-	174.0	Caltrans 2015
14-inch timber piles	Install	158.0	-	174.0	Caltrans 2015

Note: It is assumed that sound levels during pile installation and removal are similar. Use of an impact hammer would be limited to 5-10 minutes per pile, if necessary.

6.3.2 Airborne Noise Levels

To assess exposure of hauled-out pinnipeds to in-air noise, NMFS uses disturbance criteria for Level B harassment of 90 dB rms re 20 µPa for harbor seals, and 100 dB rms re 20 µPa for all other types of pinnipeds, including Steller sea lions. These criteria for in-air sound do not differentiate among sound types. Note that all in-air sound discussed in this document is referenced to 20 µPa, unless otherwise noted.

The Project component that is expected to generate the most in-air noise is impact installation of 30-inch steel piles. However, measurements of in-air noise from impact installation of 30-inch piles are not available; therefore, noise measurements from installation of 48-inch piles were used as a proxy. Although impact installation will only occur for a short period of time, the in-air noise level for this activity was conservatively applied to all construction activities.

Measurements of in-air noise resulting from impact installation of 48-inch piles were collected for two different hammers during the 2016 Test Pile Program for the Anchorage Port Modernization Program. In-air noise levels during impact installation with the hydraulic hammer were the highest at 102.5 dB (POA 2016), and this value was chosen as a conservative estimate for impact installation of 30-inch steel piles for Tenakee Springs (Table 6-4).

Table 6-4. Estimates for in-air sound Levels generated during pile installation

Method and Pile Type	Sound Level (dB) at 15 meters	Source
Diesel Impact Hammer 48-inch permanent steel pipe	101.0	POA 2016
Hydraulic Impact Hammer 48-inch permanent steel pipe	102.5	POA 2016

6.3.3 Ambient Noise

Ambient noise is background noise that is composed of noise from many sources and from multiple locations (Richardson et al. 1995). In general, ambient noise 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 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 6-5).

Table 6-5. 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 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)

The area surrounding Tenakee Springs is frequented by fishing vessels and tenders; ferries, barges, tugboats, and float planes; and other commercial and recreational vessels that use municipal docks and the small boat harbor. High levels of vessel traffic are known to elevate ambient sound levels in the marine environment.

Ambient underwater measurements have not been conducted for the Project. Although ambient underwater noise levels greater than 120 dB rms are commonly recorded in areas with large tidal fluctuations, strong currents, or high levels of vessel activity, 120 dB rms is generally regarded as the typical background noise level in maritime environments of the North Pacific. The 120 dB rms background ambient noise level is also used by NMFS as the default for regulatory purposes, including incidental take estimation under the MMPA, and will be used for this Project.

6.4 Distances to Sound Thresholds and Areas

6.4.1 Underwater Noise

Vibratory and impact pile installation will generate underwater noise that could potentially disturb marine mammals in the Project area. Ambient underwater sound levels were assumed to be 120 dB rms for this evaluation (see Section 6.3). The SSLs for proposed pile installation activities were estimated by using the results of measurements from the best available and most relevant sound source verification studies (Table 6-6).

Attenuation levels measured at other ports in coastal Alaska ranged from a 14.6 to a 21.9 dB decrease in SPL per tenfold increase in distance (Denes et al. 2016; MacGillivray et al. 2016; Warner and Austin 2016b). For example, monitoring at Kodiak Pier 1 calculated transmission loss (TL) coefficients of 20.3 during impact hammering and 21.9 during vibratory installation (Warner and Austin 2016b). However, NMFS typically recommends a default practical spreading loss of 15 dB per tenfold increase in distance when site-specific empirical data are unavailable. Using a TL coefficient of 15 dB produces conservative estimates of harassment thresholds for the Project.

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 2016b). 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 SSV studies used for source level estimates are unknown. All necessary parameters were available for the SEL_{cum} (cumulative Single Strike Equivalent) 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 (Table 6-6). 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 6-6). Therefore, should the contractor expect to install fewer piles in a day than the maximum anticipated, a smaller Level A shutdown zone would be adequate to avoid take.

For vibratory pile installation, Level A harassment isopleths range from 1 to 19 meters for all functional hearing groups (Table 6-6). For drilling, Level A harassment isopleths range from 2 to 81 meters for all functional hearing groups. For impact installation, Level A harassment isopleths range from less than 1 meter to 176 meters, with the largest Level A zones calculated for high-frequency and low-frequency cetaceans (Table 6-6; Figure 6-1 and Figure 6-2). Overall, Level A harassment zones for impact installation are relatively small because of the few strikes required to proof the piles. The maximum aquatic areas encompassed within the Level A harassment isopleths do not exceed 0.1 square kilometer (Table 6-7). To avoid and minimize incidental Level A exposure of marine mammals, a conservative shutdown zone of 100 meters will be used during most monitoring and a 200-meter shutdown zone will be implemented for low-frequency and high-frequency cetaceans during impact installation of 24-inch and 30-inch piles at a rate of two or three per day (see Section 11).

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 proposed pile installation and removal activities were estimated using the results of measurements from the best available and most relevant sound source verification studies (Table 6-6).

The formula for transmission loss is $TL = X \log_{10} (R/10)$, where R is the distance from the source, assuming the near-source levels are measured at 10 meters and X is the TL coefficient (i.e., $15 \log_{10}$ in this case). This TL model, based on the default practical spreading loss assumption, was used to predict the distances to the Level B disturbance isopleths for the underwater noise levels generated by pile installation for the Project (Table 6-6).

For vibratory pile installation, Level B harassment isopleths range from approximately 2.2 to 10.0 kilometers. For drilling, Level B harassment isopleths are conservatively estimated as 10.0 kilometers for all pile sizes (Table 6-6; Figure 6-3). For impact installation, Level B harassment isopleths range from 7 meters for the smallest piles (14- and 18-inch) to approximately 2.1 kilometers for 30-inch steel piles (Table 6-6; Figure 6-3).

Land forms (including causeways and breakwaters) are impenetrable by underwater noise and create shadows where noise from construction will not be audible. In Tenakee Inlet, aquatic noise from the Project will be partially blocked by the north shore of Tenakee Inlet (Figure 6-3). The maximum aquatic areas ensonified during pile installation and removal for the Project are presented in Table 6-7. To quantify the maximum aquatic areas ensonified, the largest isopleth (10,000 meters) was clipped (where necessary on the south shore of Tenakee Inlet) by a standardized shoreline dataset for southeast Alaska that represents the mean high tide line.

Table 6-6. Calculated distances to Level A and Level B harassment isopleths during pile installation and removal

Type of Pile	Activity	Piles Installed or Removed per day	Level A Harassment Zone (meters)					Level B Harassment Zone (meters), Cetaceans and Pinnipeds
			Cetaceans			Pinnipeds		
			LF	MF	HF	PW	OW	
Vibratory (120 dB)								
30-inch steel	Install	3	11	1	16	7	1	10,000
24-inch steel, 20-inch steel, 18-inch steel	Install	3	6	1	9	4	1	5,412
18-inch steel, 16-inch steel	Remove	10	13	2	19	8	1	5,412
14-inch steel, 14-inch timber, 12.75-inch steel	Remove	10	5	1	8	3	1	2,154
Drilling (120 dB)								
30-inch steel, 20-inch steel	Install	3	55	5	81	34	3	10,000
24-inch steel, 18-inch steel	Install	3	42	4	62	26	2	10,000
Impact (160 dB)								
30-inch steel	Proofing	1	70	3	82	37	3	2,057
		2	110	4	131	59	5	
		3	144	6	171	77	6	
24-inch steel	Proofing	1	71	3	85	38	3	1,585
		2	113	4	135	61	5	
		3	148	6	176	79	6	
20-inch steel	Proofing	3	64	3	76	34	3	584
18-inch steel	Proofing	3	<1	<1	<1	<1	<1	7
14-inch timber	Install	10	<1	<1	<1	<1	<1	7

Note: Impact proofing, if necessary, would require only 5–10 minutes per pile.

Table 6-7. Calculated areas ensounded within Level B harassment isopleths during pile installation and removal

Type of Pile	Activity	Level B Harassment Zone (km ²), Cetaceans and Pinnipeds
Vibratory (120 dB)		
30-inch steel	Install	78.9
24-, 20-, 18-, and 16-inch steel	Install	45.3
14-, 12.75-inch steel, and 14-inch timber	Remove	7.3
Drilling (120 dB)		
30-, 24-, 20-, and 18-inch steel	Install	78.9
Impact (160 dB)		
30-inch steel	Proofing	6.7
24-inch steel	Proofing	4.0
20-inch steel	Proofing	0.6
18-inch steel	Proofing	<0.1
14-inch timber	Install	<0.1

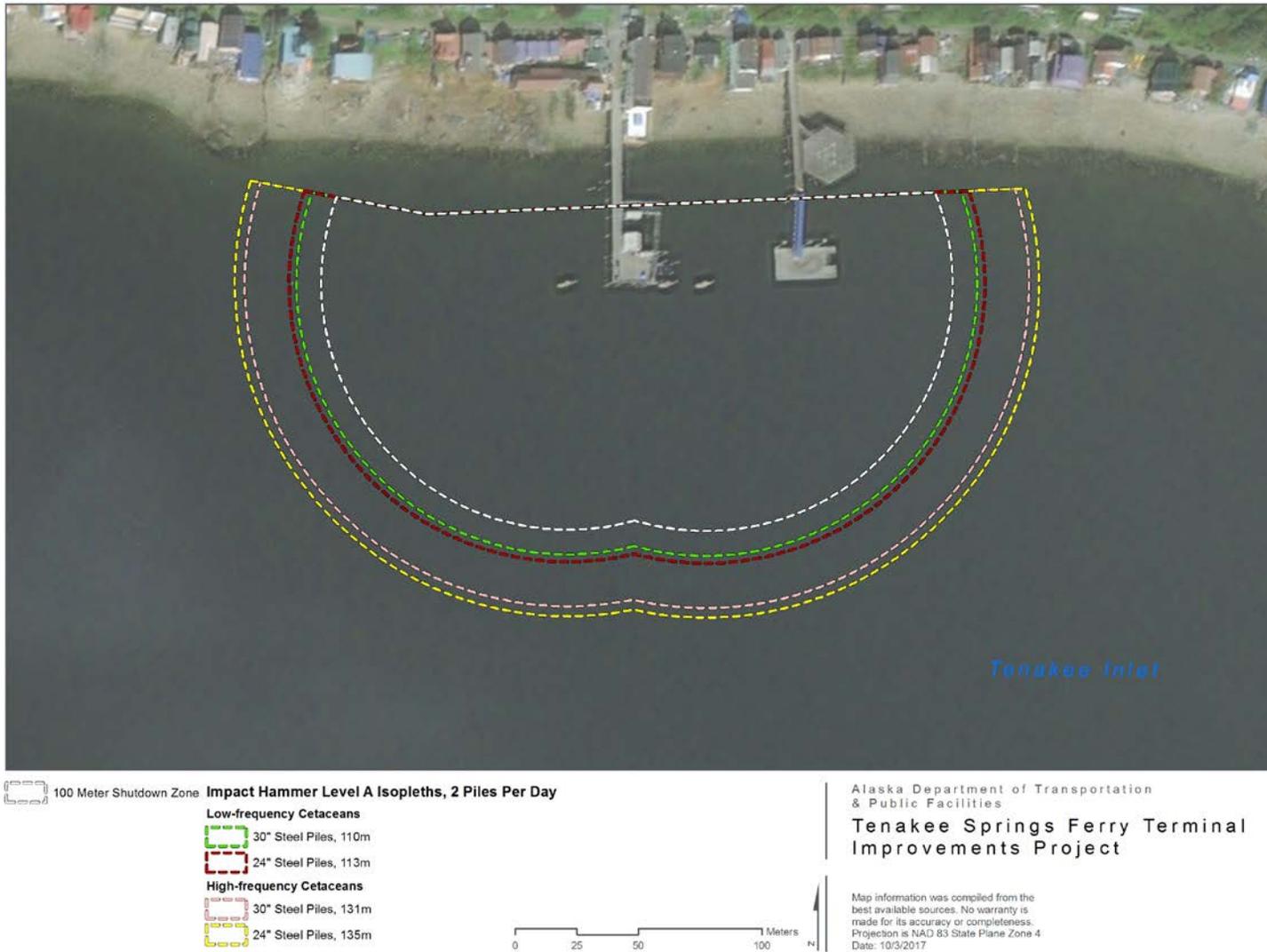


Figure 6-1. Underwater distances to the Level A harassment isopleths for LF and HF cetaceans from impact pile installation of two piles per day

Note: Harassment zone based on vectors radiating from the noise source where landforms and solid structures block sound as illustrated.

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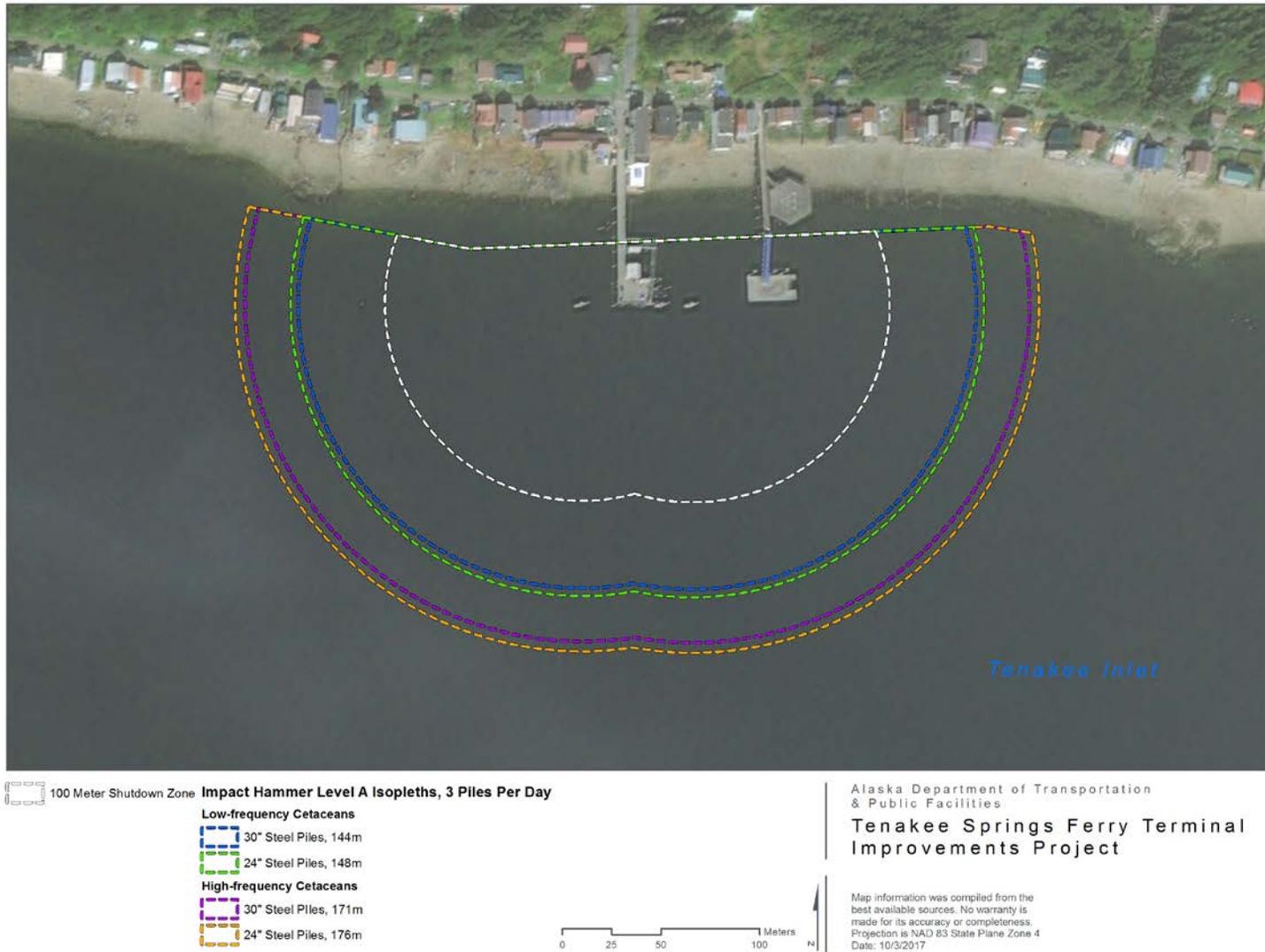


Figure 6-2. Underwater distances to the Level A harassment isopleths for LF and HF cetaceans from impact pile installation of three piles per day

Note: Harassment zone based on vectors radiating from the noise source where landforms and solid structures block sound as illustrated.

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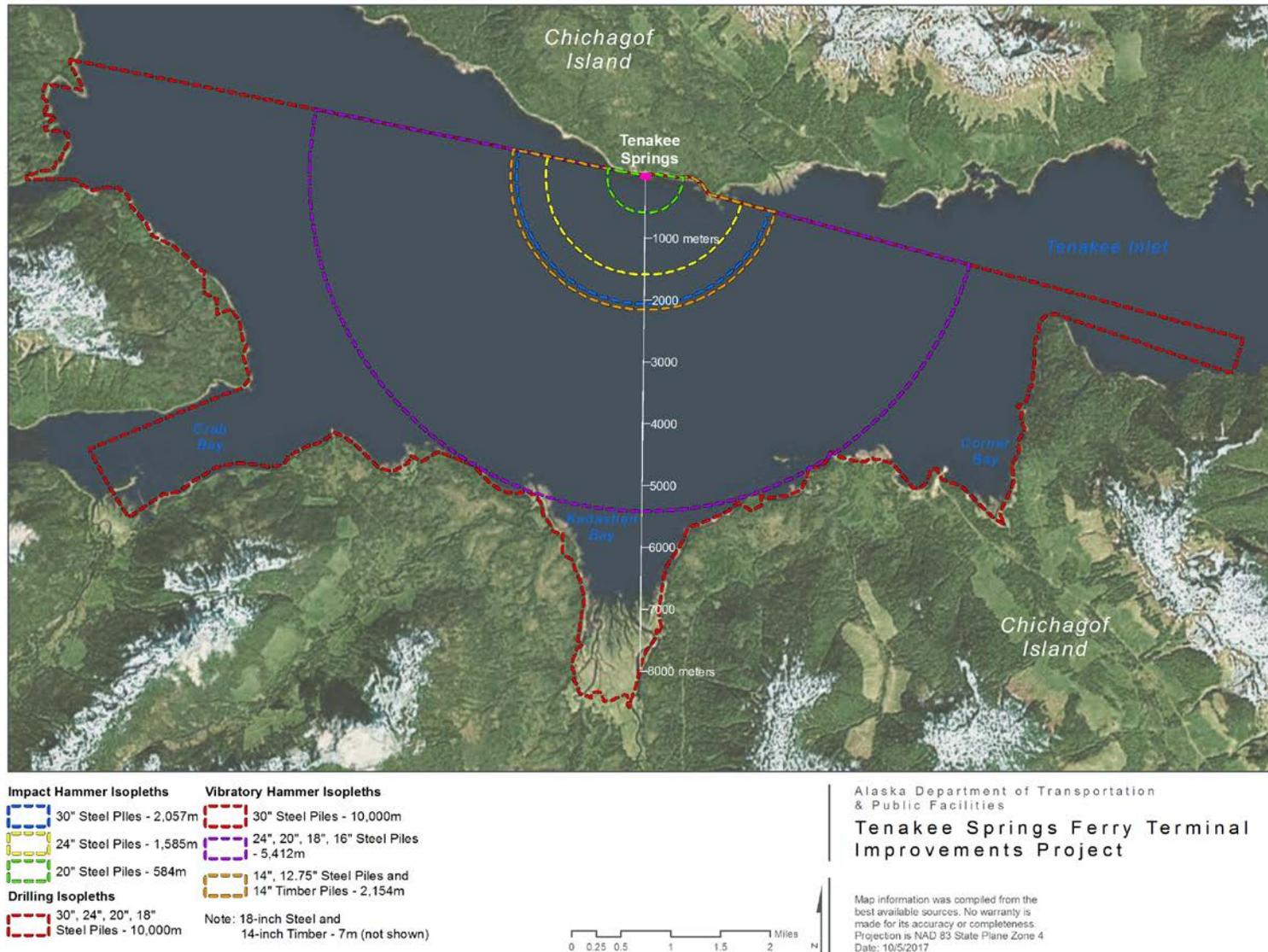


Figure 6-3. Underwater distances to Level B isopleths

Note: Harassment zone based on vectors radiating from the noise source where landforms and solid structures block sound as illustrated.

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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 with sound transmission loss of 6.0 dB per doubling distance for a hard surface ($D = D_o * 10^{[(Construction\ Noise - Ambient\ Sound\ Level\ in\ dBA)/\alpha]}$; WSDOT 2015) was used to estimate noise threshold distances from the mean source levels. In the model,

D = the distance from the noise source

D_o = the reference measurement distance (15 meters [50 feet] in this case)

α = 20 for hard ground, which assumes a 6 dBA reduction per doubling distance

Given the conservative source level chosen for impact pile installation of 48-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. Therefore, the distance to the airborne sound level threshold from impact pile installation of all pile types and sizes for the Project is 20 meters for pinnipeds except harbor seals, and 64 meters for harbor seals (Table 6-8).

Table 6-8. Distances from Tenakee construction activity where airborne sound will attenuate to NMFS threshold for Level B harassment, and estimated Source Levels at 15 m (dB re: 20µPa)

Method, pile type	Harbor Seals (90 dB)	Other Pinnipeds (100 dB)	Source Level (dB @ 15 m)
Impact Hammer			
All Project piles	64 meters	20 meters	102.5 (POA 2016)

6.5 Estimated Takes

6.5.1 Steller Sea Lions

Steller sea lion abundance in the Project area is highly seasonal in nature; sea lions are most active between October and March (Figure 4-2). Our exposure estimate is conservatively based on the average winter (October to March) abundance of 140 sea lions at Tenakee Cannery haulout, which is 8.9 kilometers away from the Project site.

It is unlikely that the entire Steller sea lion population from the Tenakee Cannery haulout would forage to the west of the haulout near the Tenakee Springs ferry terminal. Additionally, Steller sea lions do not generally forage every day, but tend to forage every 1–2 days and return to haulouts to rest between foraging trips (Merrick and Loughlin 1997; Rehburg et al. 2009).

Together, this information indicates that only half of the Steller sea lions at the Tenakee Cannery haulout (i.e., average of 140 during winter) is likely to approach the Project site on any given day and be exposed to sound levels that constitute behavioral harassment; not every Steller sea lion will be exposed every day. An estimated 70 Steller sea lions is the maximum number of individual Steller sea lions likely to forage in the underwater behavioral harassment zone on a given day; the actual number would likely be much lower. Therefore:

*70 Steller sea lions per day * 93 days of exposure = 6,510 potential exposures*

Assuming that 17.8 percent of the Steller sea lions around Tenakee are from the western DPS (see Section 4.1.2), the estimated 140 Steller sea lions that potentially could be exposed to elevated sound levels multiple times represent 0.05 percent of the western DPS (currently estimated at 53,303 individuals) and 0.28 percent of the eastern DPS (currently estimated at 41,638 individuals; Table 6-9). Any disturbance would be temporary and would not impact the long-term health of individuals; the viability of the population, species, and stock would remain stable.

Any construction activity that takes place between April and September is expected to result in significantly lower sea lion exposure rates. Additionally, the above estimate is likely high because sea lions are more likely to forage after dark when their prey is more active and when construction will not occur. The largest Level A harassment zone for otariid pinnipeds extends 6 meters from the noise source; therefore, because the project will implement a 100-meter shutdown zone during all pile installation, no Level A take is requested for Steller sea lions.

6.5.2 Harbor Seals

Harbor seals are non-migratory; therefore, the exposure estimates are not dependent on season. We anticipate Level B harbor seal take to be relatively high, given the Level B impact, drilling, and vibratory isopleths, and the presence of three established haulouts within 10 kilometers (the largest Level B harassment zone) of the Project site. The best available abundance estimate for the Project area is 259 individual harbor seals (Section 4.2.2).

The number of harbor seals that potentially could be exposed to elevated sound levels within the largest Level B harassment zone (10 kilometer radius) was estimated by calculating the percentage of available harbor seal habitat within this zone. Of the 233.35 square kilometers of available habitat in Tenakee Inlet, 78.9 square kilometers or 33.82 percent will be within the largest Level B harassment zone. Of the 259 harbor seals that haul out in the Inlet, approximately 87.57 harbor seals (33.82 percent of 259 individuals) could be within the Level B harassment zone and exposed to sound levels that reach the Level B threshold each day. Therefore:

*87.57 harbor seals per day * 93 days of exposure = 8,144 potential exposures*

The estimated 259 harbor seals that would be taken multiple times represent 3.6 percent of the Glacier Bay/Icy Strait stock, which is estimated at 7,210 individuals. Any disturbance would be temporary and would not impact the long-term health of individuals; the viability of the population, species, and stock would remain stable. Harbor seals that are hauled out would not be available to be taken; only harbor seals in the water could potentially be exposed to noise levels that could be considered Level B harassment.

During impact installation of 24-inch piles, the Level A harassment isopleth for phocid pinnipeds (i.e., harbor seals) extends up to 79 meters from the noise source (assuming optimal productivity of three piles per day; Table 6-6 and Figure 6-1), which is within the 100-meter shutdown zone. Harbor seals often act curious of onshore activities and they can swim quickly in rapidly changing directions. However, given that impact proofing will occur for only a few minutes at a time (i.e., 5–10 minutes per pile, or a total of 30 minutes per day for a production rate of three piles per day), it is unlikely that Level A take of harbor seals would occur during the Project and no Level A take is requested.

6.5.3 Harbor Porpoises

Harbor porpoises are non-migratory; therefore, our exposure estimates are not dependent on season. Based on a density estimate of 0.033 harbor porpoise per square kilometer (km²; Hobbs and Waite 2010; Section 4.3.2), we estimate that approximately 2.6 harbor porpoises could occur daily within the 78.9 square kilometer (Table 6-7) Level B harassment zone (i.e., 0.033 per km² * 78.9 km² = 2.6 harbor porpoises per day). Therefore:

$$2.6 \text{ harbor porpoises per day} * 93 \text{ days of exposure} = 242 \text{ potential exposures}$$

No Level A take is requested for harbor porpoises.

6.5.4 Dall's Porpoises

Dall's porpoise are non-migratory; therefore, our exposure estimates are not dependent on season. We anticipate approximately one observation of a Dall's porpoise pod in the Level B harassment zone (Figure 6-1) each week during construction. Based on an average pod size of 3.7 (Wade et al. 2003) we estimate 53 Dall's porpoise could be exposed to Level B harassment noise during the 93 day construction period (i.e., 3.7 individuals per week * 13.2 weeks of construction = 48.8 [rounded up to 49] total potential exposures).

No Level A take is requested for Dall's porpoises.

6.5.5 Killer Whales

Local marine mammal experts indicate that approximately two killer whale pods are observed in Tenakee Inlet each month, year-round (Lewis, S., pers. comm.). It is assumed that all three killer whale stocks are equally likely to occur in the area because no data exist on relative abundance of the three stocks in Tenakee Inlet. The exposure estimate is conservatively based on resident pod size, which has been quantified and is known to be larger than pod size for the other stocks. Resident killer whales occur in a mean group size of 19.3 during the fall in southeast Alaska (Dahlheim et al. 2009).

Therefore, we assume that a total of approximately 120 killer whales could be exposed to Level B harassment over the course of the Project (i.e., [19.3 individuals per pod * 2 pods per month] * 3.1 months = 119.7 [rounded up to 120]). Transient killer whale group sizes are smaller, so this take estimate is likely high. No Level A take is requested for killer whales.

6.5.6 Humpback Whales

Humpback whales are present in Tenakee Inlet year-round. Local experts indicate that as many as 12 humpback whales are present on some days from spring through fall, with lower numbers during the winter (S. Lewis and M. Dahlheim, pers. comm.). We conservatively estimate that half of those, or 6 individuals on average, could be exposed to Level B harassment during each day of pile installation and removal, therefore:

$$6 \text{ humpback whales per day} * 93 \text{ days of exposure} = 558 \text{ potential exposures}$$

The Level A harassment zone for humpback whales does not exceed 176 meters. Therefore, no Level A take is requested for humpback whales.

6.5.7 Minke Whales

Minke whales may be present in Tenakee Inlet year-round. Their abundance throughout southeast Alaska is very 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

could occur near the Project area. Therefore, we conservatively estimate that one minke whale could be exposed to Level B harassment each month during construction, or a total of 3 minke whales during the 93-day construction period.

6.6 All Marine Mammal Takes Requested

The analysis of marine mammal take for the Project predicts 6,510 potential exposures of 140 individual Steller sea lions, 8,144 potential exposures of 259 individual harbor seals, 242 potential exposures of harbor porpoises, 49 potential exposures of Dall's porpoises, 120 potential exposures of killer whales, 558 potential exposures of humpback whales, and 3 potential exposures of minke whales to noise from pile installation over the course of construction that could be classified as Level B harassment under the MMPA. Therefore, DOT&PF requests 15,626 total Level B takes of these marine mammals (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 Individuals Potentially Exposed to Level B Harassment	Stock Abundance	Percent of Population ^a
		Total	By Stock			
Steller sea lion	Eastern DPS	6,510	5351	115 individuals	41,638	0.28
	Western DPS		1159	25 individuals	53,303	0.05
Harbor seal	Glacier Bay/Icy Strait	8,144		259 individuals	7,210	3.6
Harbor porpoise	Southeast Alaska	242		242	975	24.8
Dall's porpoise	Alaska	49		49	83,400	0.06
Killer whale	West Coast transient	120	10	10	243	4.2
	Alaska resident		98	98	2,347	4.2
	Northern Resident		12	12	290	4.2
Humpback whale	Central North Pacific	558		558	10,103	5.5
Minke whale	Alaska	3		3	N/A	N/A
Total		15,626		1,371	N/A	N/A

^a The percent of population is based on the proportion of take that is expected to occur from each stock based on abundance (see Section 4.1 for Steller sea lions). Killer whale stocks are assumed to be equally likely to occur.

N/A: Not Applicable or no stock population assessment is available.

7 DESCRIPTION OF POTENTIAL IMPACTS OF THE ACTIVITY TO 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 to 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 environmental conditions.

7.1 Assessment of Potential Acoustic Impacts

Behavioral and physiological impacts from noise exposure differ among species. Differences in response 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 (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) has suggested four zones 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 temporary threshold shift (TTS) when hearing loss is temporary or permanent threshold shift (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 (1996) 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 SEL. 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 proposed 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 proposed 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 and 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 harbor area with regular vessel activity, including recreational craft, local ferries and tourist cruises, commercial fishing vessels, and twice-weekly 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 activity 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 potentially displace marine mammals from the immediate area of the activity; however, they would 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 event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory 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 (Ketten 1998; 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 (such as 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. These takes are unlikely to have any impact on recruitment or survival, and therefore, would 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 underwater impacts to individual marine mammals from pile installation activities. Impacts to 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.

Level B take of Steller sea lions, harbor seals, and humpback whales would 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 that will occur. Estimates of Level B take of harbor porpoises, Dall’s porpoises, killer whales, and minke whales represent small proportions of affected stocks.

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8 DESCRIPTION OF POTENTIAL IMPACTS TO SUBSISTENCE USES

Alaska Natives have traditionally harvested subsistence resources in southeast Alaska for many hundreds of years, particularly large terrestrial mammals, salmon, and other fish (ADF&G 1997). Harbor seals are the marine mammal species most regularly harvested for subsistence in Tenakee Springs (ADF&G 1987). There are several harbor seal haulouts in Tenakee Inlet and the vicinity (London et al. 2015; Section 4.2.2).

Subsistence information for Tenakee Springs is available from the Tongass Resource Use Cooperative Study (ADF&G 1987) conducted in 1984 and 1987. Based on this research, only about 4.2 percent of households in Tenakee Springs harvest marine mammals, while approximately 9.7 percent consume marine mammals. Based on data from 1987, approximately 9 harbor seals and 30 other marine mammals (likely also harbor seals) are harvested annually (ADF&G 1987). Measured in pounds harvested, marine mammals account for approximately 2.3 percent (721 pounds) of all subsistence harvest in Tenakee Springs.

All Project activities will take place within the immediate vicinity of Tenakee Springs, and therefore the Project will not have an adverse impact on the availability of marine mammals for subsistence use at locations farther away. Some minor, short-term disturbance of the harbor seal haulout near town could occur, but this is not likely to have any measureable effect on subsistence harvest activities in Tenakee Inlet. No changes to availability of subsistence resources will result from Project activities.

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9 DESCRIPTION OF POTENTIAL IMPACTS TO MARINE MAMMAL HABITAT

9.1 Effects of Project Activities on Marine Mammal Habitat

The Project will generally occur within the same footprint as the existing ferry terminal and facilities. Little to no new habitat loss or alteration will occur as a result of the Project. Furthermore, the nearshore and intertidal habitat where the Project will occur is an area of relatively high marine vessel and aircraft traffic. Most marine mammals do not generally use the area within the footprint of the existing ferry terminal. Temporary, intermittent, and short-term habitat alteration may result from increased noise levels within the Level B harassment zones. Effects on marine mammals, as described above, would be limited to temporary displacement from pile installation noise and effects on prey species (Section 9.2).

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). Adverse effects on EFH are not expected. Fish populations in the Project area that serve as marine mammal prey could be temporarily affected by noise from in-water pile installation. 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 potentially 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).

Drilling of rock sockets and pile installation and removal may result in a small increase in sedimentation within a few feet of the piles. A small amount of sediment and drill tailings may be deposited in proximity to each pile. All sediments will be contained on site with a floating silt curtain which will allow all sediments and tailings to settle at the base of the pile. Minor and temporary increases in turbidity may result from this process, but the effects on fish and marine mammal prey would be negligible. Indirect effects to prey would be insignificant and discountable due to the temporary nature of the activity, and are expected to be undetectable to marine mammals.

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

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

Descriptions of the proposed Project impacts on habitat were discussed in Section 9. The effects of the proposed Project on marine mammal habitat are expected to be short-term and minor. 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 would not be permanent and would not have long-term effects. The proposed 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 other noise sources will be temporary and intermittent.

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11 MITIGATION MEASURES

The exposures outlined in Section 6 represent the maximum potential number of marine mammals, 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, those 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 A).

11.1 Pile Installation and Associated Activities

Pile installation mitigation measures include:

- The Project was designed with relatively small-diameter piles, which will avoid the elevated noise impacts associated with larger piles.
- Marine Mammal Observers (MMOs) will be employed as described in Section 13.
- For in-water heavy machinery work other than pile driving (e.g., barges, tug boats), if a marine mammal comes within 10 meters, operations shall cease and vessels shall reduce speed to the minimum level required to maintain safe steerage and working conditions until the marine mammal is at least 10 meters away from the vessel or activity.
- Pile installation, proofing, and removal will occur only during daylight hours, when visual monitoring of marine mammals can be conducted.
- 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. Ramping up will then begin only after the MMO has determined, through sighting, that the animal(s) has moved outside the Level B harassment zone.
 - 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 activities. During impact pile proofing, the shutdown zone shall include all areas where the underwater SPLs are anticipated to equal or exceed the Level A (injury) harassment criteria. A conservative shutdown zone of 100 meters will be used during monitoring to prevent incidental Level A exposure for most species. However, should a marine mammal enter the 100-meter shutdown zone, Level A take will not occur until that individual crosses the Level A harassment isopleth specific to the species and in-water activity underway (Table 6-2).

During impact installation of 24-inch and 30-inch steel piles at a frequency of two or three piles per day, the Level A harassment zone exceeds the 100-meter shutdown zone for low- and high-frequency cetaceans (i.e., humpback whales, harbor porpoises, and Dall's porpoises; Table 6-6). During the short duration of this activity (impact proofing of 24-inch and 30-inch steel piles at a frequency of two or three piles per day for 5–10 minutes per pile), MMOs will implement a 200-meter shutdown zone to avoid take of harbor porpoises, Dall's porpoises, minke whales, and humpback whales (low-frequency and high-frequency cetaceans). A 100-meter shutdown will be implemented for Steller sea lions, harbor seals, and killer whales.

For those marine mammals for which Level B take has not been requested, in-water pile installation/removal and drilling will shut down immediately when the animals are sighted. If a marine mammal authorized for Level B take is present in the Level B harassment zone, in-water activities may continue and a Level B take will be recorded. Pile installation and drilling activities 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), from the shutdown zone, or from outside the Project area. If Level B take reaches the authorized limit, then 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 TO SUBSISTENCE USERS

The proposed Project is not known to occur in an important subsistence hunting area. It is a developed area with regular marine vessel traffic. However, DOT&PF plans to provide advanced public notice of construction activities to reduce construction impacts on local residents, ferry travelers, adjacent businesses, and other users of the Tenakee Springs ferry terminal 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 Project area. If any tribes express concerns regarding Project impacts to subsistence hunting of marine mammals, further communication between 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.

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13 MONITORING AND REPORTING

Monitoring measures will be implemented along with mitigation measures (Section 11) to minimize impacts to marine mammals during the Project, as discussed in detail in the Marine Mammal Monitoring Plan (Appendix A). The monitoring plan will focus on visual observations. It should be noted that the title MMOs is intended to be synonymous for consultation, documentation, and construction purposes.

Trained MMOs will collect sighting data and behavioral responses to construction for all marine mammals observed within the harassment zones during construction. In-water pile installation/removal or drilling will be shut down if marine mammals for which no take has been authorized are observed approaching the Level B harassment zone during impact pile installation. In-water work will remain shut down until marine mammals for which no take has been authorized have left the harassment zone. For marine mammals for which take authorization has been received, pile installation activities may continue if the marine mammal enters the Level B harassment zone and take is documented.

In general, trained or experienced observers will be present during all pile installation operations. Observers 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. Observers must maintain verbal contact with construction personnel to immediately call for a halt of pile installation operations to avoid exposures 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 will 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.
- When a team of two or more MMOs is required, one will be designated as the lead MMO or monitoring coordinator. The lead MMO must have prior experience working as an observer.
- Observer curriculum vitae will be submitted to and approved by NMFS.
- 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 and species of marine mammals observed
 - Dates and times when in-water construction activities were conducted
 - Dates and times when in-water construction activities were suspended to avoid potential harassment of marine mammals observed within a defined shutdown zone
 - Marine mammal behavior
- 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

Two MMOs will be positioned at the best practical vantage point(s). This position may vary based on construction activity and locations of piles or equipment. The monitoring location(s) will exhibit the following characteristics:

- Have an unobstructed view of the pile being driven,
- Have an unobstructed view of the Level A harassment zone, and
- Be located in a safe location.

The MMOs will begin observations 30 minutes prior to the start of pile installation/removal, and will continue to observe for 30 minutes after completion of pile installation/removal. 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:

- If waters exceed a sea-state that restricts the MMO's ability to make observations within the Level A zone of the pile driving activity (e.g., excessive wind or fog), pile installation and removal will cease. Pile driving will not be initiated until the entire shutdown zone is visible.
- If any marine mammal species not authorized for take are encountered during activities and are likely to be exposed to Level B harassment, then in-water activities will cease and 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 it is within, if applicable. The harassment zones are shown in Table 6-6 and Figure 6-1 and Figure 6-2.
- Ongoing in-water pile installation/removal and drilling may be continued during periods when conditions such as low light, darkness, high sea state, fog, ice, rain, glare, or other conditions 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 the duration of driving activities.

13.3 Data Collection

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

- Date and time that pile installation begins or ends
- Construction activities occurring during each observation period
- Weather (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 activities to marine mammals, if pile installation is occurring during marine mammal observation
- 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 underwater and airborne sound levels occurring at the time of the observable behavior
- Actions performed to minimize impacts to marine mammals
- 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 Steller sea lions, harbor seals, harbor porpoises, Dall's porpoise, killer whales, and humpback whales observed during the course of construction

See Appendix A 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 all 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, Federal Highway Administration), and the State of Alaska.

The DOT&PF will cooperate with other marine mammal monitoring and research programs taking place in the Tenakee Springs area. The DOT&PF will also assess mitigation measures that can be implemented to eliminate or minimize any 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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Appendix A

Marine Mammal Monitoring and Mitigation Plan

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Marine Mammal Monitoring Plan

Tenakee Springs Ferry
Terminal Improvements
Project

State Project # Z68145 / 0991006

March 2018

Prepared for:
Alaska Department of Transportation and Public Facilities
6860 Glacier Highway
Juneau, Alaska 99801

Prepared by:
HDR
2525 C Street, Suite 500
Anchorage, Alaska 99503

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Attachments

Attachment 1: Example Data Forms	
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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



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1.0 INTRODUCTION

The Alaska Department of Transportation and Public Facilities (DOT&PF) will implement the following Marine Mammal Monitoring Plan during pile installation and removal for the Tenakee Springs Ferry Terminal Improvements Project (Project) in Tenakee Springs, Alaska. This Marine Mammal Monitoring 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 Project will involve removal of some of the existing piles and structure, and installation of new piles and structure in the marine environment. The Project has the potential to generate elevated levels of underwater and in-air 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).

This Marine Mammal Monitoring Plan describes the methods that have been developed to avoid, minimize and mitigate potential harassment to marine mammals during pile installation and removal, and to monitor and record the extent of harassment if it does occur.

This Marine Mammal Monitoring Plan must be used in conjunction with the Tenakee Springs IHA, and the Tenakee Springs Biological Opinion and Incidental Take Statement, issued by NMFS. 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 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 technique, and pile size and type (see Project IHA). Distances to the Level A harassment thresholds vary by pile installation technique, pile size and type, and the amount of time or number of strikes required for installation or removal (see Project IHA).

To avoid incidental Level A take, a shutdown zone of 100 or 200 meters will be used, as appropriate, to avoid Level A take of different marine mammal species and as outlined in the Project IHA. Although every effort will be made to shut down before marine mammals enter the 100-meter or 200-meter shutdown zone, if the Level A isopleth for a species is smaller than 100 meters, 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. At Tenakee Springs, noise from vibratory, impact, and drilling installation will be blocked from ensonifying some marine areas in Tenakee Inlet 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, two Protected Species Observers (PSOs) will be present during vibratory, impact, and drilling pile installation and pile removal. PSOs will search for, monitor, document, and track marine mammals around and within the Level A and Level B harassment zones (Figures 2-1 through 2-3). Isopleths smaller than 100 meters are not shown in the figures because the shutdown zone will be 100 meters. 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 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 two locations simultaneously. A primary PSO will be placed at the terminal where pile installation and removal will occur. A second observer will range the uplands on foot or by ATV along Tenakee Avenue, observing from Grave Point east of the harbor west of the Project site to view Tenakee Inlet and the Level B harassment zone. Considerations will include:

- 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:

- 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 any 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 time 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 Wildlife Observer 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 when initially sighted, 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 near by
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, summarize the data recorded during monitoring, and estimate 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.

- Numbers of days of observations
- Lengths of observation periods
- Locations of observation station(s) used and dates of 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 any 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 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).

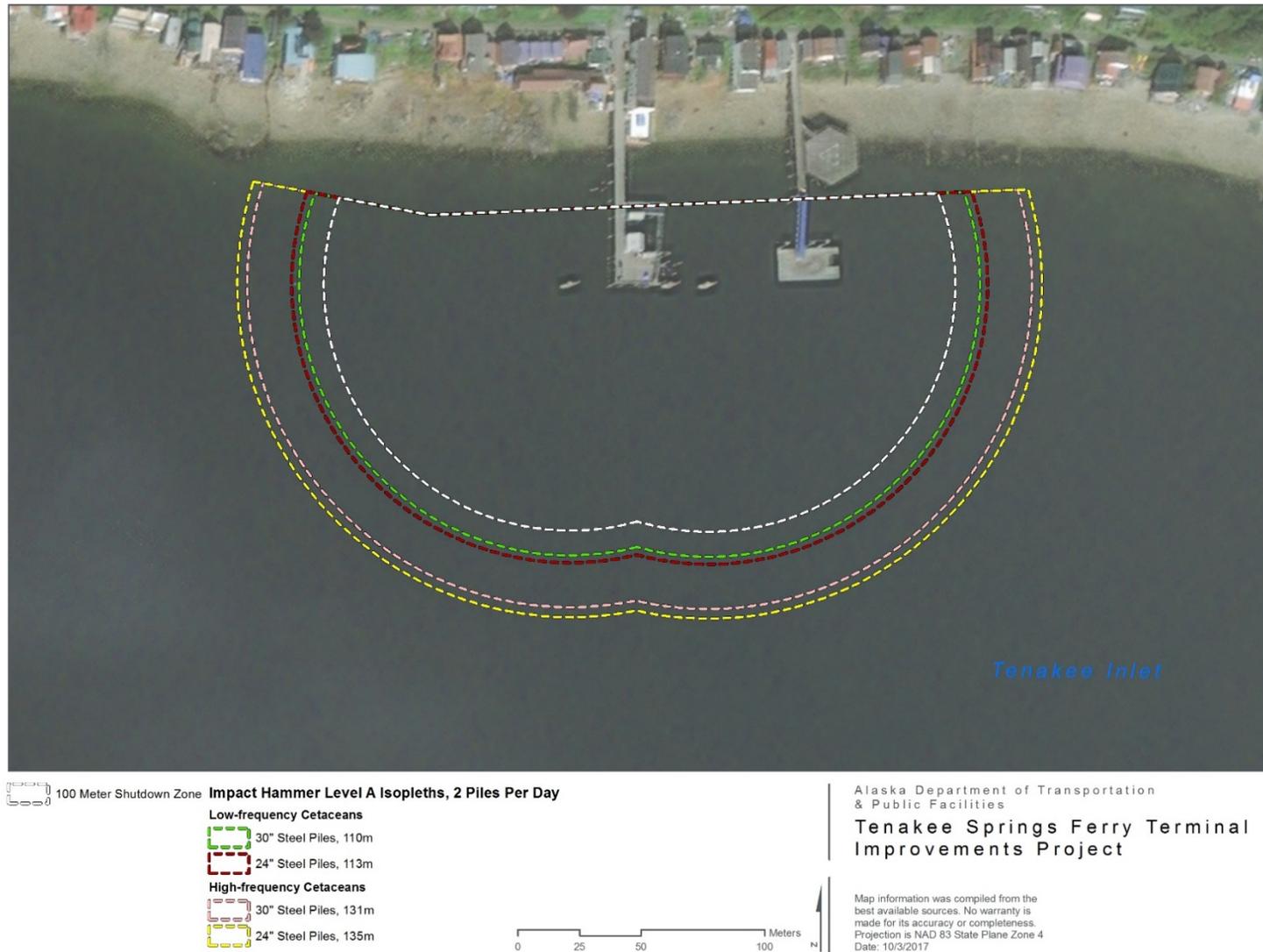


Figure 2-1. Underwater distances to the Level A harassment isopleths during impact pile installation of two piles per day

Note: Harassment zone based on vectors radiating from the noise source where landforms and solid structures block sound as illustrated.

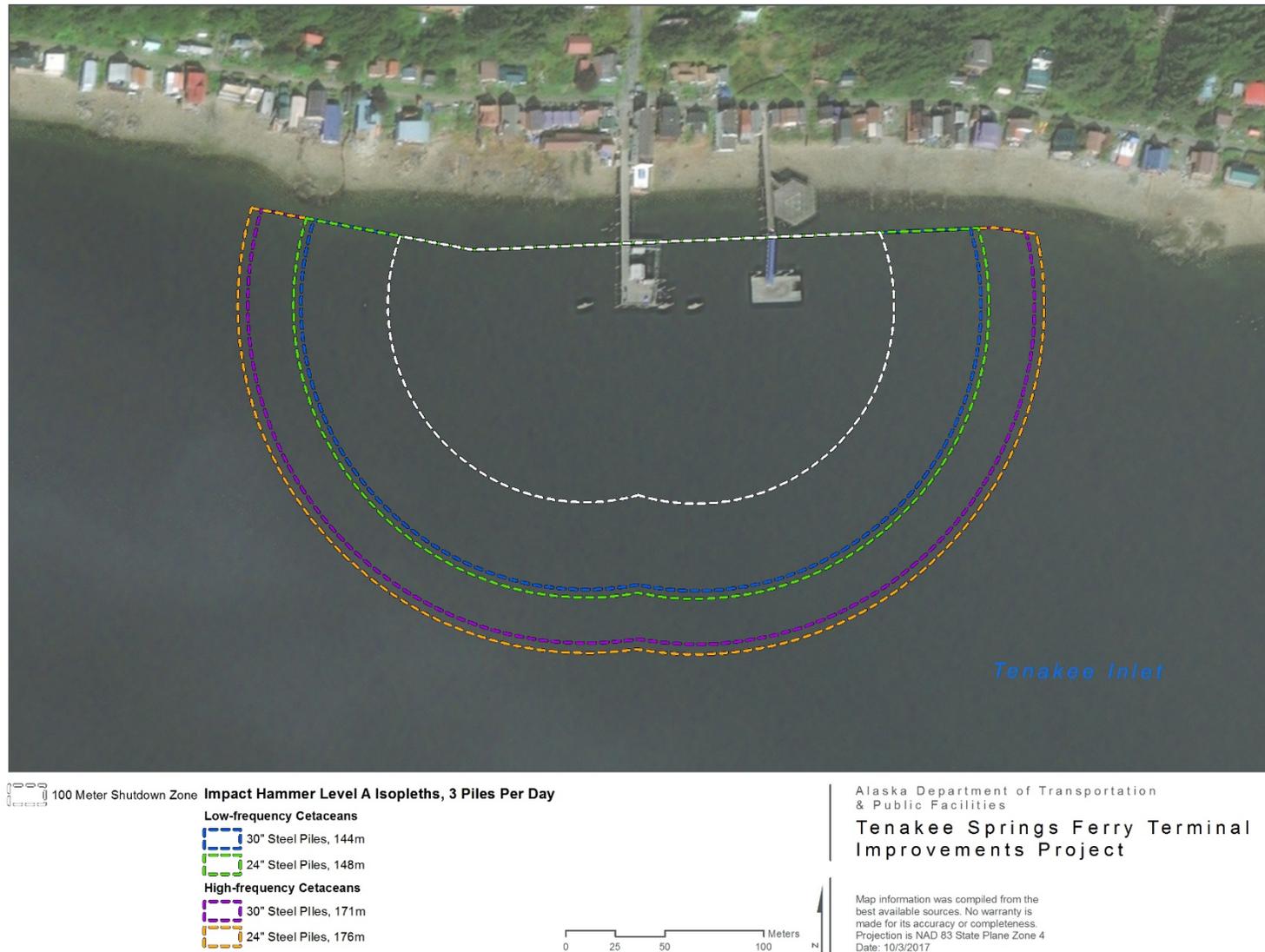


Figure 2-2. Underwater distances to Level A harassment isopleths during impact installation of three piles per day

Note: Harassment zone based on vectors radiating from the noise source where landforms and solid structures block sound as illustrated.

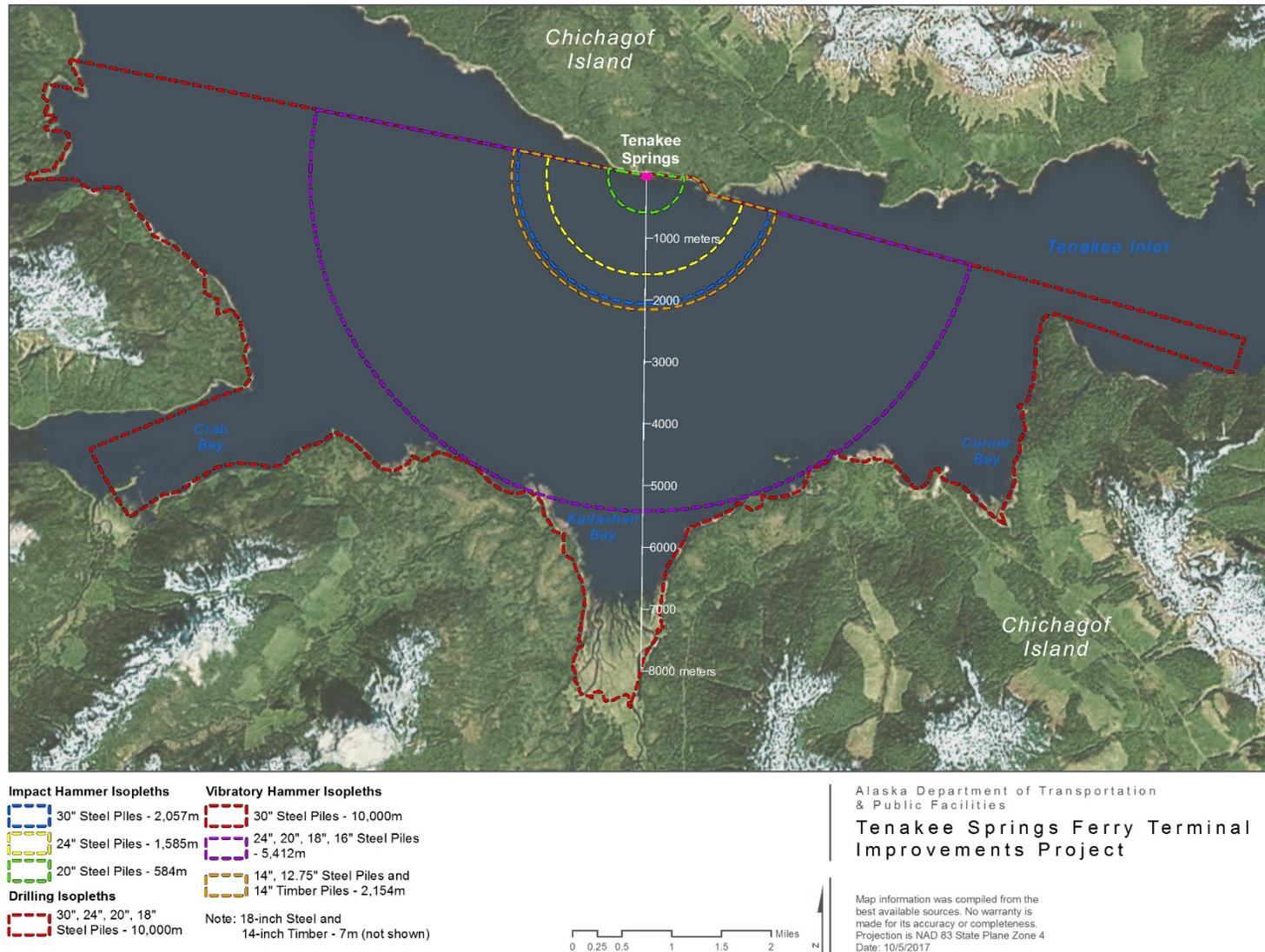


Figure 2-3. Underwater distances to Level B harassment isopleths during impact vibratory, and drilling installation of piles

Note: Harassment zone based on vectors radiating from the noise source where landforms and solid structures block sound as illustrated.



Attachment 1: Example Data Forms



Marine Mammal Sighting Form

Project:	Location:	Sighting #: <small>(1st sighting of the day is Sighting#: 1)</small>
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	Closest Distance		Max Count		Juveniles		Unkn. Age	
Time Entered H-Zone B		Harbor Porpoise	Final Distance		Best Count		Male		Female	
Time Exited H-Zone B		Dall's Porpoise					Unknown Sex			
Time Entered H-Zone A		Killer Whale								
Time Exited H-Zone A		Humpback								
		Fin Whale								
		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

