Request for an Incidental Harassment Authorization

Under the Marine Mammal Protection Act

for the

Sentinel Island Moorage Float

Gastineau Channel Historical Society

Juneau, Alaska

Revised March 2020

Submitted to:
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ACRONYMS AND ABBREVIATIONS

- ADEC Alaska Department of Environmental Conservation
- ADF&G Alaska Department of Fish and Game
- BMP best management practice
- CM cubic meters
- CWA Clean Water Act
- CV coefficient of variation
- CY cubic yards
- dB decibel
- DPS distinct population segment
- EA each
- eDPS Eastern Distinct Population Segment
- ESCA Endangered Species Conservation Act
- ESA Endangered Species Act
- FR Federal Register
- GCHS Gastineau Channel Historical Society
- HTL high tide line
- Hz hertz
- IHA Incidental Harassment Authorization
- MHW mean high water
- MLLW mean lower low water
- MMMP Marine Mammal Monitoring Plan
- MMPA Marine Mammal Protection Act
- MSE Mechanically Stabilized Earth
- NMFS National Marine Fisheries Service
- NOAA National Oceanic and Atmospheric Administration
- PND PND Engineers, Inc.
- PTS permanent threshold shift
- RMS root mean square
- SEL Sound Exposure Level
- SEL_{CUM} Cumulative Sound Exposure Level
- SFT square feet
- SPAR Spill Protection and Response
- SPL sound pressure level
- SQM square meter
- SSL Steller Sea Lion
- TTS temporary threshold shift
- USACE United States Army Corps of Engineers
- USFWS United States Fish and Wildlife Service
- wDPS Western Distinct Population Segment
- WFA Weighting Factor Adjustment

1 Description of the Activity

1.1 Introduction

The Gastineau Channel Historical Society (GCHS) is proposing to construct an access float on Sentinel Island within Favorite Channel/Lynn Canal in Juneau, Alaska to provide access to the historical Sentinel Island Lighthouse which was listed on the National Register of Historic Places in 2002.

The proposed project will occur in marine waters that support several marine mammal species. The Marine Mammal Protection Act of 1972 (MMPA) prohibits the taking of all marine mammals, which is defined as to "harass, hunt, capture or kill, or attempt to harass, hunt, capture or kill," except under certain situations. Section 101(a)(5) (D) of the MMPA allows for the issuance of an Incidental Harassment Authorization (IHA), provided an activity results in negligible impacts to marine mammals and would not adversely affect subsistence use of these animals. The project may result in exposure of marine mammals protected under the MMPA to sound levels above allowable noise harassment or non-serious injury thresholds.

1.2 Project Purpose and Need

The primary purpose of the proposed Sentinel Island Access Float project is to provide safe access to the island at a variety of tidal ranges for maintenance activities. Improved access would make beach landings safer and more convenient for volunteers and contractors to perform historic preservation activities on the Sentinel Island Lighthouse facilities. As a secondary purpose, the GCHS desires to offer tours of the historic lighthouse to the public. The CGHS currently rents out the lighthouse overnight and would like to offer day tours, for which the proposed activity would also provide access for. The anticipated nature of these tours is discussed in detail in Section 9.1. Improved access would also provide safe water access for educational and recreational activities for the general public. Due to wind and wave conditions at Sentinel Island, piles socketed into bedrock are necessary to secure the structure and to provide winter storage for the gangway.

1.3 Project Description

The Sentinel Island Lighthouse was originally constructed in 1902 and was reconstructed in 1935. The reconstructed lighthouse is currently on Sentinel Island. The Sentinel Island Lighthouse was listed on the National Register of Historic Places in 2002 and is one of Alaska's eleven historic lighthouses. In 2004 the Sentinel Island Lighthouse was transferred to the Gastineau Channel Historical Society from the U.S. Coast Guard. This particular lighthouse has a history of being difficult to access and to service, due to the lack of a good landing area and due to exposure to the wind and sea.

In a similar location to the proposed facility there was a timber dock with a hoist house and a fuel line that was demolished in 2004 (Figures 1 and 2). The fuel line was connected to an uplands oil house that previously existed on the southeastern side of Sentinel Island.

The proposed project would install a pile supported marine float with a metal gangway spanning from the float to a timber platform on Sentinel Island. The facility would be seasonal use only due to wave and wind conditions which would likely damage the facility if left in place during winter months. The float would be removed in winter to be stored at another location. The piles have been designed to serve as a gangway storage frame during winter months and the gangway will be lifted and hung from the piles, out of the water during the winter months. The float is anticipated to be in place at Sentinel Island annually from April to October.

Materials would be transported to the site using a tug/barge combination. Pile driving will be conducted from the anchored barge, utilizing a down-the-hole drill to install rock sockets and a vibratory hammer to install piles. Impact hammers shall only be allowed for piles that encounter soils too dense to penetrate with the vibratory

equipment, however their use is not anticipated. Vibratory pile driving/drilling equipment will be specified as the primary installation method for the project. The float and gangway will be unloaded from a barge and placed in/over the water. Alternatively, the float may be towed to the site.

The installation of each pile will require a combination of drilling and vibratory hammers. For this application, because all piles will require rock sockets and therefore drilling, the noise level for drilling has been assumed for all hours of pile installation. The process for installing piles will vary slightly based on the amount of overburden at each location, as well as the contractor's means and methods, however the general sequence is vibratory hammer – drill – vibratory hammer. Installation starts with use of the vibratory hammer, then drilling will begin at the bedrock interface and then the final setting of the pile in the drilled socket will be done with the vibratory hammer. The actual amount of time the vibratory hammer will be required varies depending on the overburden present, however the amount of time the vibratory hammer will be used is minimal compared to drilling time.

After the piles are installed, the float will be installed by placing it in the water and connecting the external pile hoops to the piles. The gangway will then be set in-place, spanning from the uplands to the float. It is anticipated that all construction will be completed within 1 week, however this is dependent on the contractor's means and methods and one week of work may be spread out over the authorization period. The barge will remain anchored on-site during construction, making only minor adjustments in position as required to perform the work. Additionally, it is anticipate that there will be a work skiff onsite to transport workers between the barge and shore, to transport the monitor(s) to and from Sentinel Island from the mainland daily, and to transport workers to and from Sentinel Island and the mainland as necessary.

After construction is complete the contractor will remove the barge from the site using a tug boat. The barge route to and from the site is currently unknown and will be dependent on the contractor selected. It will also be dependent on the other projects the selected contractor has going on prior to and after the Sentinel Island Access Float project, as it will determine where the equipment needs to be transported after the project is complete.

Figure 1. Former Dock Structure (Demolished in 2004)

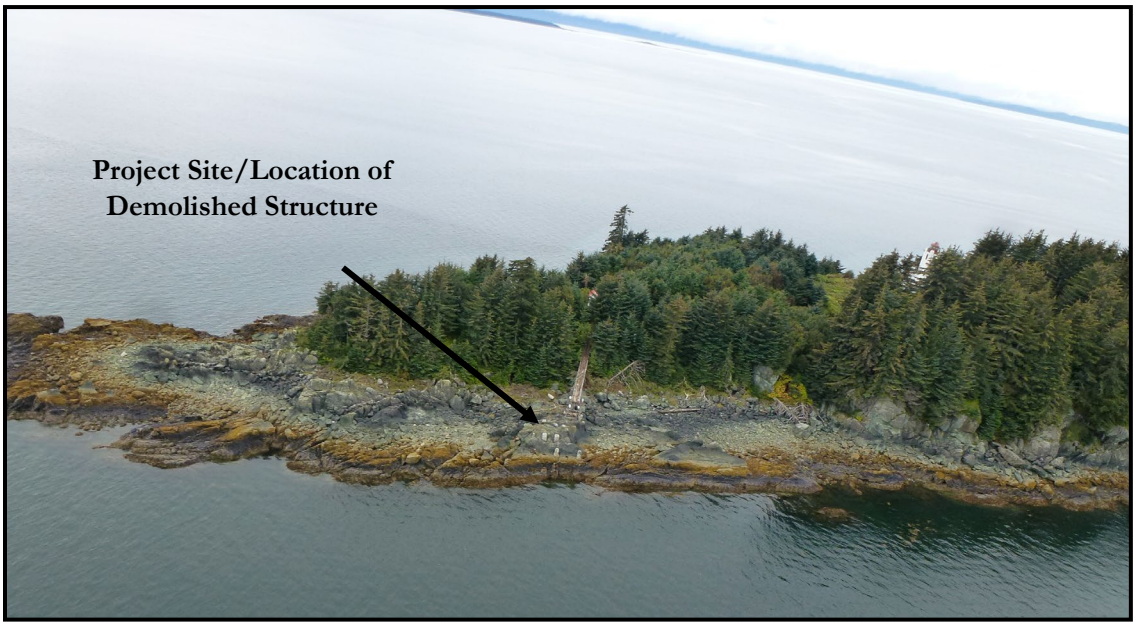

Figure 2. Current Site Conditions

Table 1. Project Quantities

Item	Size and Type	Total Below HTL El. = 20.6 ft (6.3 m)
Gangway	8 feet x 88 feet (2.44 meters x 26.82 meters)	N/A; overwater structure
Float	16 feet x 60 feet (4.88 meters x 18.23 meters)	N/A; overwater structure
Piles	24-inch diameter steel pipe piles	6

Table 2. Pile Driving Summary

Activity	# piles	Pile Size/Type	Method	Average Piles/day [1] (Range)	Driving Days	Daily Duration	Estimated Total Daily Duration
Pile Installation	6	24-inch; steel	Drilling	1 (1-2)	3-6	360 minutes/pile	12 hours/ 500 strikes
			Impact (if needed)	1 (0-2)		250 strikes/pile	

[1] Piles per day and driving days are given as a range as actual driving days are dependent on actual conditions encountered in the field and the contractor's means and methods. For each pile a combination of a vibratory hammer and a down-the-hole hammer (and if needed, an impact hammer) will be used throughout the pile driving process and throughout each day of pile driving. To estimate the noise impacts it is conservatively assumed that a contractor will be able to install 2 piles per day, resulting in up to 12 hours of work per day. As such, in all Level A isopleth calculations it is assumed that up to 2 piles could be driven per day, for both drilling and impact methods. However, in Section 6 the maximum number of days which work may occur over is considered. In order to be conservative when estimating the number of days an animal may be exposed, the maximum number of days (6) is used.

2 Dates, Duration, and Region of Activity

2.1 Dates

The project will occur between July 15, 2020 and September 20, 2020. IHA authorization is requested for this time period only. The following general construction sequence is anticipated, subject to adjustment by the construction contractor's means and methods:

- Mobilization of equipment
- Pile installation, float and gangway installation
- Demobilization of equipment

2.2 Duration

During summer months, long workdays are anticipated due to available daylight. The daily construction window for pile driving will begin no sooner than 30 minutes after sunrise and will end 30 minutes before sunset to allow for pre- and post-activity monitoring respectively (see Section 11 and the Marine Mammal Monitoring Plan in Appendix B for a detailed discussion of monitoring and mitigation measures).

2.3 Region of Activity

The project site is located within Sections 25 and 30, T. 38 S., R. 63 E. and 64 E., Copper River Meridian; USGS Quad Map Juneau C-3; Latitude 58°33' N., Longitude 134°55' W.; in Juneau, Alaska.

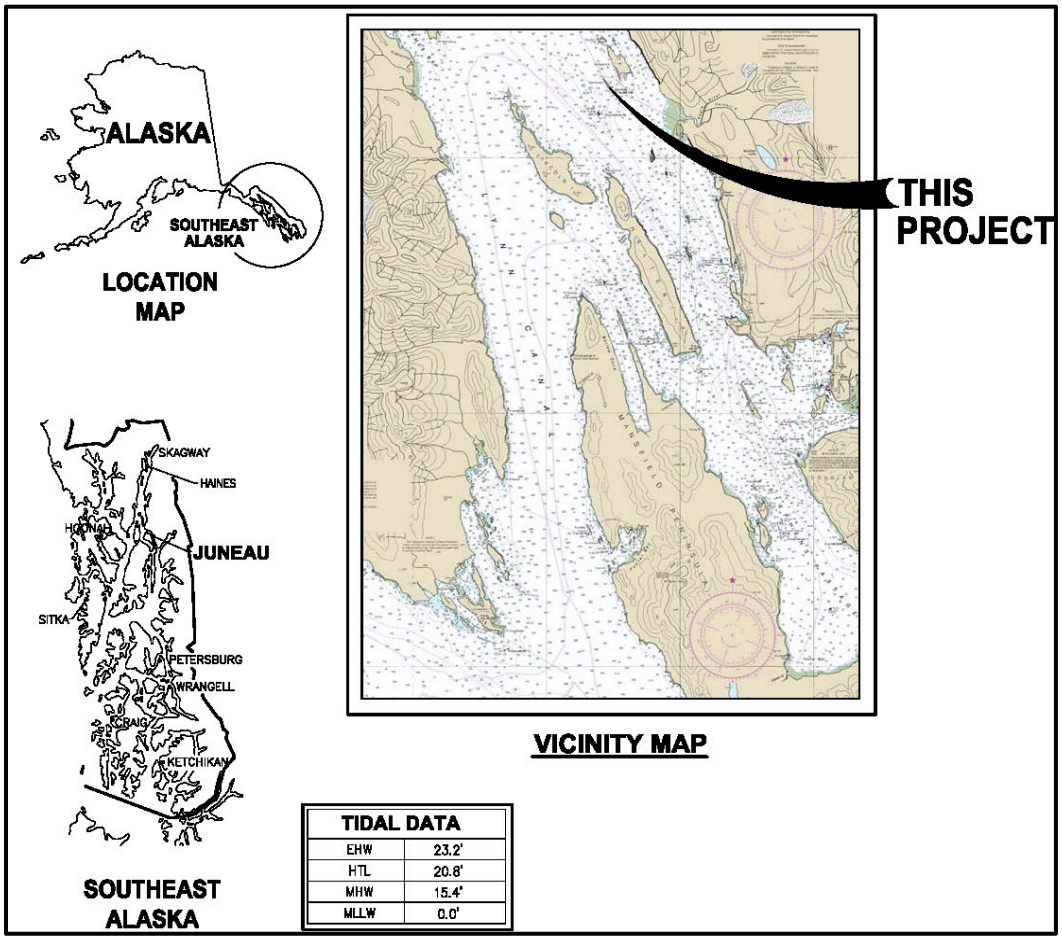

Figure 3. Region of Activity

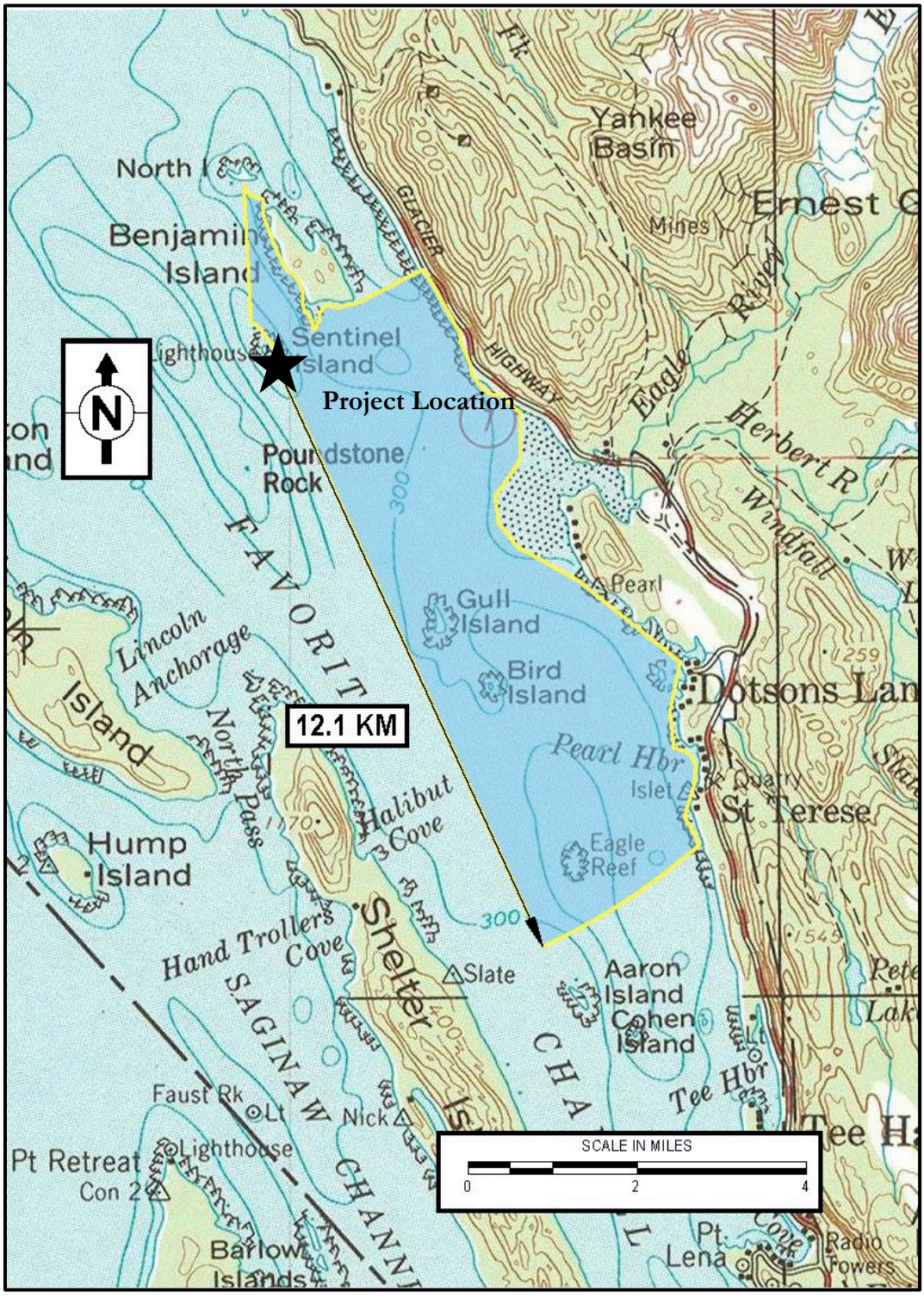

Figure 4. Action Area[1] (largest Level B Harassment Zone)[2]

[1] See Section 5 for detailed discussion of harassment isopleths
[2] Map from: USGC AK Topo Series, Juneau, Alaska – Canada (1:250,000)

2.4 Geographic Setting

Sentinel Island is located at the northern end of Favorite Channel where Lynn Canal and Favorite Channel converge. The project site is located just north of the mouths of the Eagle and Herbert rivers, two glacially fed rivers. At the project site on Sentinel Island the substrate generally consists of bedrock (NMFS 2018) and the substrate on the southern shore of Benjamin Island generally consists of sand and gravel overlying bedrock (NOAA 2019).

2.4.1 Prey Species

Several seasonally available prey species are abundant in dense aggregations in the action area. In particular, herring are abundant in dense aggregations in the spring and fall, coinciding with when Steller sea lion numbers peak at Benjamin Island (Womble 2003). Sea lion scat has been sampled at Benjamin Island to determine Steller sea lion prey during the spring, fall and winter. However, because Steller sea lions are typically absent from Benjamin Island during the summer, when construction will occur, no sampling of Steller sea lion scat has occurred during the construction period at Benjamin Island (Womble 2003).

NOAA's Nearshore Fish Atlas has records of sampling, during the construction season, at (4) locations within the action area that were conducted on various occasions from 2001 to 2003 (NOAA 2019). Two of the sampling locations were near the project site on Sentinel Island and two were located on the south side of Benjamin Island, within the action area. At Sentinel Island, fish captured during July and August include walleye Pollock, pacific herring, pacific cod, silverspotted sculpin, northern sculpin, leister sculpin crescent gunnel, tubesnout, juvenile cod, juvenile clingfish and fish larvae (NOAA 2019). At Benjamin Island, fish captured during July and August include rock sole, pacific sand land, sturgeon poacher, snake prickleback, buffalo sculpin, pacific staghorn sculpin, northern sculpin, armorhead sculpin, pacific herring, Dolly Varden, pacific sandfish, pacific cod, tubenose poacher, starry flounder, crescent gunnel and coho salmon. These species are expected to be in the action area during construction.

Other prey species may be available at other times of the year, however due to the limited authorization period only species which may be present during the authorization period (July-September) are considered in this application. However, there are a couple of species that occur in dense aggregations within the action area in the spring and fall that are known to be of importance to marine mammals. These are worth noting as the project will be timed to avoid impacts to these species (Section 11). Steller sea lion distribution is closely associated with seasonal availability of prey and Steller sea lions tend to select sites where prey is locally concentrated (Womble *et al.* 2009, Womble 2003). At Benjamin Island, herring was found to be the primary prey species of Steller sea lions (Womble *et al.* 2009). Steller sea lion numbers peak in the action area, at Benjamin Island, in the spring and fall likely for the spring spawning of herring and the return of herring in the fall to their overwintering grounds (Womble *et al.* 2009, Womble 2003). During the winter the energetic content of herring is highest (Vollenweider 2005) and is particularly important to Steller sea lions during this time (Womble *et al.* 2009). Other forage species including eulachon and capelin also spawn in southeast Alaska during the spring (Womble *et al.* 2009). Out-migrating juvenile salmon may also be present during the spring, typically between May 1 and June 30. Because Steller sea lions typically vacate Benjamin Island from mid-July to late-September it is likely that high-density prey is less available in the action area during this time and by constructing during this time impacts to marine mammals, their prey and habitat are minimized.

2.4.2 Currents

The waters of Favorite Channel are estuarine with the Mendenhall River, a glacially supplied river, supplying the major freshwater input. The Coriolis Effect tends to deflect the freshwater to the north and along the shores of Favorite Channel and Saginaw Channel towards Lynn Canal. The waters of Favorite Channel are stratified during

high runoff periods (summer months) with a brackish, low salinity surface layer with depths ranging from a few inches to up to 30 feet (9.15 meters), typically between 15 feet and 30 feet (4.57 meters to 9.15 meters) (Wright and Bishop 1987). It is within this upper surface layer that the most active, surface currents are located.

Currents were metered in the southern portion of Favorite Channel at Lena Point and were found to be strong and erratic. Surface currents were approximately 1.8 knots and extended to depths ranging from 15 feet to 30 feet, however were expected to be even stronger following heavy rainfall.

Currents in the project area are generally driven by the tide, however reports from fishermen during the summer salmon trolling season indicate that currents are almost always to the north, regardless of the tidal stage. This was substantiated during current metering, however there was one day during low flow where typical reverse current patterns were observed indicating that the predominant northern current is driven primarily by runoff and that more typical currents prevail during low runoff. During the summer and fall months, periods of high runoff, are predominately to the north and during winter and spring months, periods of low runoff, currents are tidally driven and reversing (Wright and Bishop 1987).

Deeper currents in the project area are more moderate, typically less than 0.3 knots, however have been observed to exceed 0.5 knots (Wright and Bishop 1987). Benthic seawater currents near Lena Point had a mean velocity of 0.1 knots and a maximum velocity of 0.5 knots during summer and winter months and were highly correlated with tidal fluctuation (Malecha *et al.* 2003).

In September, water temperatures were found to be around 10.5°C at the surface, increasing to around 11.75°C at a depth of 10 feet (3.05 meters) and dropping back down towards 11°C between 20 feet (6.1 meters) and 50 feet (15.24 meters). Salinity during the beginning of September increased with depth from 22 parts per trillion at the surface to 26 parts per trillion at a depth of 40 feet (Wright and Bishop 1987).

2.4.3 Marine Debris and Pollution

The environment within the action area consists of relatively undeveloped habitat, however there has been historical development on Sentinel Island including the Sentinel Island Lighthouse and associated marine structures. The area is also regularly utilized by marine vessels which may contribute noise, marine debris and/or pollution such as trash or hydrocarbons to the environment. In addition to historical development, the area is also frequently used by a large variety of vessels (Section 2.5.1). No known sampling of subsurface sediments or water has occurred in the immediate project area. A number of spills have been reported on the ADEC Spills database within Favorite Channel and Lynn Canal including spills of diesel, hydraulic oil, aviation fuel and unknown petroleum products.

The old dock that was removed in 2004 was supported on timber piles, which were likely treated with creosote. Creosote treated wooden piling and structures are known to release significant concentrations of PAHs into seawater during summer months and during periods of high boating activity. This resulting leachate concentration of PAHs is toxic to herring embryos developing in eggs adhering directly to pilings and within 10 cm of piling surfaces. Herring embryo exposure to these concentrations resulted in increased mortality rates, skeletal defects and retarded swimming ability (Duncan, 2014). These effects can have population-level consequences to Pacific herring, a key prey resource of both Humpback whales and Steller Sea Lions (Short *et al* 2003, Wynne 2015). However, this structure was removed in 2004 and the new facility will utilize steel pilings which are not known to leach contaminants.

2.5 Acoustic Environment

Marine mammals are sensitive to both airborne (pinnipeds) and underwater noises (pinnipeds and cetaceans) that may cause injury or mask interspecific/intraspecific communication. Background levels of noise in the Favorite Channel/Lynn Canal environment are higher than ambient conditions due to sources of airborne and in-water noise sources in the area.

2.5.1 Underwater Noise

The ambient underwater soundscape of the action area is a product of bathymetry, seabed hardness and structures that may attenuate, reflect or ricochet sounds from sources. Typical anthropogenic sounds at the project site likely consist primarily of boat motors. Natural sounds include marine mammal and fish sounds, plus surface-generated wind and waves.

JASCO Applied Sciences measured underwater sounds at the nearby Auke Bay ferry terminal during improvement construction projects and characterized sound levels associated with vibratory pile driving, rock socket drilling and impact hammer pile driving. Sound levels were recorded immediately prior to the pile driving/drilling, but it is not clear whether the pre-impact sound level included background sound of equipment or reflects ambient sound levels (Denes *et al.* 2016). At the time of this writing, no ambient background undersea sound data for the project area have been located.

The Favorite Channel/Lynn Canal area that Sentinel Island is located in is an area frequented by a large number of vessels. The number and size of vessels present in the area varies greatly dependent on a number of factors such as whether or not there is a commercial fishing opener; how many whales are in the area and how accessible they are to whale watch vessels; the number of cruise ships/visitors in town; ferry/shipping schedules; and the weather. The project site is located approximately 20 miles (30 km) north of Statter Harbor, Juneau's largest harbor where many commercial and recreation vessels transit to and from the Lynn Canal area. Within Auke Bay, vessel traffic also comes from the privately-owned Fishermen's Bend moorage facility and the Auke Bay Ferry Terminal. Some vessel traffic may also transit to the area from Amalga Harbor, which is a vessel launching/retrieval facility (no vessel moorage) located approximately 5.5 miles (9 km) south of the project site. Vessel traffic generally consists of commercial whale watch vessels ranging in capacity from approximately 12 passengers to over 100 passengers, with both jet boats and outboard motors; commercial fishing vessels; recreations vessels; charter fishing vessels; commercial shipping vessels; cruise ships and ferries. Favorite Channel is a route for the Alaska Marine Highway System ferries and commercial shipping. While quantifying vessel traffic in the area is difficult, Figure 5 illustrates a portion of the commercial fishing vessels that may be present in the vicinity of the action area.

Figure 5. Commercial Fishing Vessels Awaiting Opener Outside Amalga Harbor (Hohenstatt 2019)

2.5.2 Airborne Noise

Current sources of airborne noise in the Sentinel Island Access Float project area include:

- Overhead aircrafts may include air traffic from the Juneau International Airport, seasonal flightseeing tourism (summer months), occasional search and rescue helicopters and commercial jet, propeller commuter or private aircraft (year-round).
- Glacier Highway single lane highway traffic.
- Commercial and recreational vessel traffic including:
    - commercial and sport fishing vessels from the nearby Amalga Harbor, as well as other harbors in Juneau;
    - commercial whale watching vessels in the area from Statter Harbor, Fishermen's Bend and private facilities near the Auke Bay Ferry Terminal;
    - Alaska Marine Highway Ferry operations between Juneau and Haines; and
    - Commercial shipping operations.

A study conducted for Statter Harbor Phases I & II is the closest known study involving collection of airborne noise (PND 2011). From one station next to the roadway, above Statter Harbor, the "typical" noise reported was about 50 dB, lasting about five seconds. Sound levels at Sentinel Island are anticipated to be lower, however the area experiences similar noises including planes overhead, wind gusts, vessels and may also receive some airborne noise from Glacier Highway, however traffic in this area is less than near Statter Harbor. Other sound levels at that site were reported as follows:

Table 3. Statter Harbor Noise Levels

No Traffic	46.2 dB
Airplane Overhead	56.7 dB
Boat Approaching Ramp	8.8 dB
Wind Gust	59 dB
Dump Truck	61.6 dB

3 Species and Number of Marine Mammals

Known distribution ranges of a number of marine mammal species, subspecies, or distinct population segments (DPSs) encompass the portion of Favorite Channel in which the proposed project will occur. The species are listed in Table 3 along with their stock or population, their occurrence in the project area, and their estimated abundance.

The Alaska Protected Resources Division Species Distribution mapper lists the humpback whale, Steller sea lion, harbor seal, Dall's porpoise, harbor porpoise, killer whale, gray whale, pacific white sided dolphin and minke whale as species with a range which may extend into the action area. However, there are no known sightings of the pacific white sided dolphin within the vicinity of the action area and this species was not observed in the Lynn Canal area of the Dahlheim *et al.* (2009) cetacean surveys.

Additionally, while not listed on the Species Distribution Mapper, the sperm whale is also known to rarely enter Lynn Canal. On March 20, 2019 a dead sperm whale was found washed up on the east side of Lynn Canal (NOAA 2019b), north of Berners Bay (Figure 6). There are (3) known individual sperm whales that have been observed in Lynn Canal on multiple occasions, however the dead whale was determined not to be one them (NOAA 2019b). The Alaska Marine Highway System (AMHS) has also reported sightings on two occasions. In December of 2019 they reported (4) sperm whales off False Point Retreat, located south of the project site in Lynn Canal as depicted in Figure 6 (NOAA 2019b). In March of 2019 AMHS reported (2) sperm whales near Point Howard, located south of the project site in the lower portion of Lynn Canal (NOAA 2019b).

The Dahlheim *et al.* (2009) surveys did not report sightings of either the gray whale or sperm whale, however sightings of both species have been increasing in Southeast Alaska (personal communication with Sadie Wright, NMFS). While sightings have increased overall, there are no known sightings in the near vicinity of the action area and the closest known sighting of a gray whale is in Tracy Arm Fjord (personal communication with Sadie Wright, NMFS), located south of the project area, and south of the area depicted in Figure 6. Neither species is known to enter the Favorite Channel area. Further, whale watch vessels have not reported seeing any Pacific white sided dolphins, sperm whales or gray whales in the Lynn Canal area (personal communication with Aaron Lambert, Alaska Tales).

Due to the extremely low likelihood of the occurrence of pacific white sided dolphin, gray whale and sperm whale at the project site and within applicable B harassment zones; these species are considered extralimital to the action area. Take of these species are not included under this request and is not discussed further in this application.

Descriptions of the humpback whale, Steller sea lion, harbor seal, Dall's porpoise, harbor porpoise, killer whale, minke whale, gray whale and sperm whale are provided in Section 4.

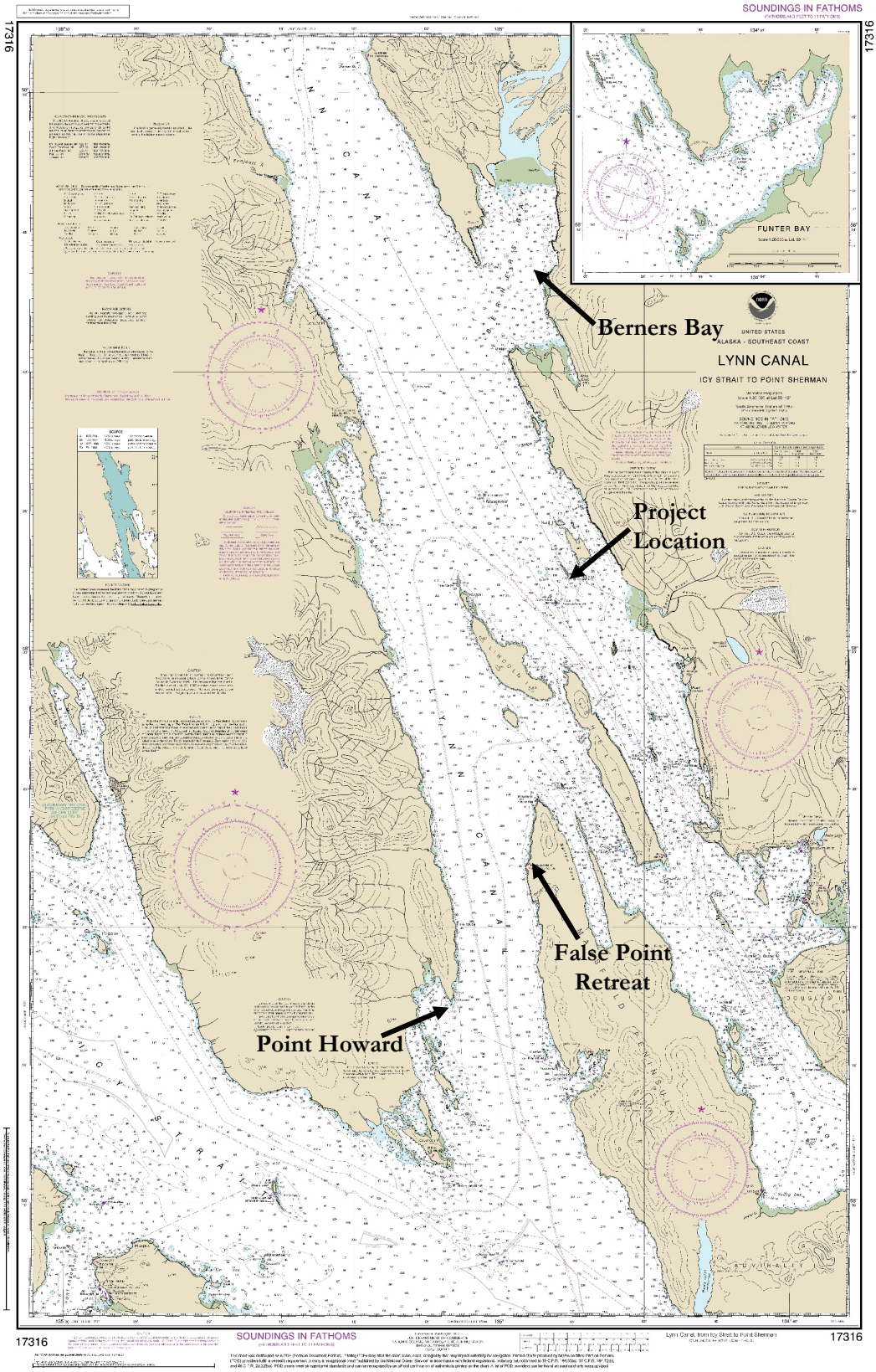

Figure 6. Locations of Sperm Whale Occurance

Table 4. Species with ranges extending into the project site

Species	Estimated Abundance[1]/ Stock	MMPA Status	ESA Status	Occurrence In/Near Project[2] (July-Sept)
Humpback whale[2] (Megaptera novaeangliae)	10,103 (Entire Central North Pacific Stock) [3]	Depleted, Strategic Stock	Threatened (Mexico DPS) & not listed (Hawaii DPS)	Common
Steller sea lion[2] (Eumetopias jubatus)	41,638 (Eastern U.S. Stock)	Protected, Nonstrategic Stock	Delisted in 2013	Intermittent[4]
	54,267 (Western U.S. Stock)	Depleted, Strategic Stock	Endangered	Rare
Harbor seal (Phoca vitulina)	9,478 (Lynn Canal/ Stephens Passage)	Protected, Nonstrategic Stock	Not listed	Common
Dall's porpoise (Phocoenoides dalli)	Unknown (Entire Alaska Stock)	Protected, Nonstrategic Stock	Not listed	Rare
Harbor porpoise (Phocoena phocoena)	975 (Southeast Alaska)	Protected, Strategic Stock	Not listed	Intermittent
Killer whale (Orcinus orca)	261 (Eastern North Pacific, Northern Residents)	Protected, Nonstrategic Stock	Not listed	Intermittent
	2,347 (Eastern North Pacific, Alaska Residents)			
	243 (West Coast Transients)			
Minke Whale	Unknown	Protected, Nonstrategic Stock	Not listed	Very Rare

[1] Abundance estimates are from the most recent Alaska stock report for 2018 (Muto *et al.* 2019) with the exception of the gray whale which is from the most recent Pacific Marine Mammals stock report for 2018 (Carretta *et al* 2019).
[2] Common: Species has known, regular occurrence in the project area; Intermittent: Species has known occurrence occasionally; Rare: Species has known occurrence nearby the project area, however has few known sightings in the action area; Very Rare: Species has range that may extend into project area, however there are no known sightings within the vicinity of the project.
[3] Humpback whales and Steller sea lions are discussed in terms of the Distinct Population Segments in the following sections to better quantify the effects to the endangered population segments.
[4] Steller sea lions commonly occur within the action area, however during the authorization period they are less common as is discussed in detail in Section 6.

4 Affected Species Status and Distribution

This section describes the status, distribution, behavior, and critical habitat for the affected species/stocks of marine mammals likely to be affected by the proposed project. Species prevalence within the project area is discussed in Section 6.

4.1 Humpback Whale (*Megaptera novaeangliae*)

4.1.1 Status

In 1970, the humpback whale was listed as endangered under the Endangered Species Conservation Act (ESCA) (35 FR 18319). In 1973 Congress replaced the ESCA with the Endangered Species Act (ESA), and humpback whales continued to be listed as endangered. Because humpback numbers subsequently increased across much of their range, NMFS conducted a global status review and reassessed the status of humpback whales under the ESA (Bettridge *et al.* 2015). Based on that review, 14 DPSs of humpback whales were identified, and listings revised as appropriate (81 FR 62260).

In the North Pacific, five DPSs that breed in subtropical and tropical waters from Asia to Central America then migrate north to feed in highly productive North Pacific feeding grounds were identified (Bettridge *et al.* 2015). Whales from three of these DPSs migrate to Alaskan waters: the Mexico DPS (ESA-listed as threatened), the Western North Pacific DPS (ESA-listed as endangered), and the Hawaii DPS (delisted) (81 FR 62260). These DPSs equate to the California/Oregon/Washington, Western North Pacific, and Central North Pacific stocks, respectively.

4.1.2 Distribution

The humpback whale is distributed worldwide in all ocean basins. Relatively high densities of humpback whales are found in feeding grounds in Southeast Alaska and northern British Columbia, particularly during summer months. Based on extensive photo identification data, NMFS has determined that individual humpback whales encountered in Southeast Alaska and northern British Columbia have a 93.9 percent probability of being from the recovered (delisted) Hawaii DPS (CV= 0.17) and a 6.1 percent probability of being from the currently threatened (ESA-listed) Mexico DPS (CV= 0.03) (Wade *et al.* 2016). There is a 0 percent probability that humpback whales in Southeast Alaska are from the endangered Western North Pacific DPS (Wade *et al.* 2016). Intermixed DPSs are not visually distinguishable; their identity can only be determined by DNA or photo identification. Therefore, we will use Wade *et al.* (2016) estimates that assume 93.9 percent of humpbacks in Southeast Alaska are from the Hawaii DPS and 6.1 percent are from the Mexico DPS.

Humpbacks migrate to Alaska to feed after months of fasting in low latitude breeding grounds. The timing of migration varies among individuals: most humpbacks begin returning to Alaska in spring and most depart Alaska for southern breeding grounds in fall or winter. Peak numbers of humpbacks in Southeast Alaska occur during late summer to early fall, but because there is significant overlap between departing and returning whales, humpbacks can be found in Alaska feeding grounds in every month of the year (Baker *et al.* 1985, Straley 1990, Witteveen and Wynne 2009). There is also an apparent increase in the number of humpbacks overwintering in feeding grounds in Alaska, including in the Juneau area (Straley *et al.* 2017, Liddle 2015).

Humpback whales occur frequently in Lynn Canal during summer and fall months to feed, but their genetic and stock-designation identities are rarely known. Data on their distribution suggests that both the Mexico DPS and Hawaii DPS of humpback whales may be present in Lynn Canal/Favorite Channel. Because humpback whale individuals of different DPS (natal) origin are indistinguishable from one another (unless fluke patterns are linked to the individual in both feeding and breeding ground), the frequency of occurrence of animals by DPS is only

estimated using the DPS ratio (estimated 6.1% Mexico DPS), based upon the assumption that the ratio is consistent throughout the Southeast Alaska region (Wade *et al.* 2016).

Some whale researchers, resource managers, and whale watching guides track the presence of individual Humpback whales in the Juneau area by unique fluke patterns (Krieger and Wing 1986, Teerlink 2017). Based on fluke pattern identification, 189 unique whales were identified in the Juneau to Glacier Bay and Seymour Canal area (Krieger and Wing 1986). In recent years, 179 individual humpback whales were identified from the Juneau area, based upon fluke photographs taken between 2006 and 2014 (Teerlink 2017).

For Lynn Canal/Favorite Channel and other waters in the project vicinity including Stephens Passage, and Saginaw Channel, researchers have documented 4 to 18 humpback whales in winter (Krieger and Wing 1986, Moran *et al.* 2018). Straley *et al* (2011) surveyed humpback whales in Lynn Canal from September 15-October 14 in 2007/2008 and during the same months in 2000/2009. During both years a total of 55 whale sighting (average of approximately 2 whales per day) were recorded, however in 2007/2008 there were 30 unique whales identified and in 2008/2009 there were 22 unique whales identified in the project vicinity. The average group size reported was 1 humpback whale, however the Level B harassment zone associated with this project is large and it is possible more than one group could be present.

Dahlheim *et al.* (2009) found significant difference in the mean group size of humpback whales from year to year and also found that the average group size was largest in the fall (September/October), however no surveys were conducted in August. Information from the fall surveys is thus utilized, and is conservative because humpback numbers were found to peak during the fall in Lynn Canal (Straley *et al.* 2011). Each year concentrations of humpback whales were observed in Lynn Canal through spring summer and fall (Dahlheim *et al.* 2009). During fall months the average group size observed was two whales. During the spring months humpback whales tend to congregate in certain areas, including the Lynn Canal area (Dahlheim *et al.* 2009). Numbers of humpback whales peak in the summer and fall, however during these times the whales are more uniformly distributed throughout the region (Dahlheim *et al.* 2009).

4.1.2.1 Hawaii Distinct Population Segment Humpback Whale (Hawaii DPS)

Humpbacks that breed around the main Hawaiian Islands have been observed in summer feeding grounds throughout the North Pacific. Most of the Hawaii DPS migrates to feeding grounds in Southeast Alaska and northern British Columbia (Bettridge *et al.* 2015). Mark-recapture analysis of identification photographs suggests the Hawaii DPS numbers approximately 10,103 individuals and is increasing (Calambokidis *et al.* 2008). A multi-strata analysis estimated the abundance of the Hawaii DPS as 11,398 individuals (CV=0.04) (81 FR 62260). As mentioned above, Wade *et al.* (2016) estimated that 93.9 percent of the humpbacks encountered in Southeast Alaska and Northern British Columbia are from the Hawaii DPS.

4.1.2.2 Mexico Distinct Population Segment Humpback Whale (Mexico DPS)

Whales in the Mexico DPS typically breed off the Revillagigedo Islands in Mexico and migrate to northern feeding grounds ranging from British Columbia to the western Gulf of Alaska. Given their widespread range and their opportunistic foraging strategies, Mexico DPS humpback whales may be in the vicinity during the proposed project activities. In the final rule changing the status of humpback whales under the ESA (81 FR 62260), the abundance of the Mexico DPS was estimated to be 3,264 individuals (CV= 0.06) with an unknown trend. Note that only a portion of the Mexico DPS migrates to Alaska for feeding; the probability that a whale encountered in Southeast Alaska and northern British Columbia is from the Mexico DPS is, again, 6.1 percent (Wade *et al.* 2016).

4.1.3 Reproduction and Breeding

During the winter months most humpback whales make a long annual migration to the low-latitude subtropical and tropical waters to breed and calve. Humpback whales do not breed or calve in Alaska waters and individuals of the Hawaii DPS (North Central Pacific stock) primarily migrate to Hawaii for breeding and calving (Muto *et al.* 2019), while Mexico DPS (California/Oregon/Washington stock) whales breed in Mexican waters.

4.1.4 Foraging

While in their Alaskan feeding grounds, humpback whales prey on a variety of euphausiids and small schooling fishes including Pacific herring (*Clupea pallasii*), longfin smelt (*Spirinchus thaleichthys*), capelin (*Mallotus villosus*), Pacific sand lance (*Ammodytes hexapterus*), juvenile walleye Pollock (*Theragra chalcogramma*), and salmon (*Oncorhynchus* spp.) smolts (Nemoto 1957, Kawamura 1980, Krieger and Wing 1986, Witteveen *et al.* 2008, Straley *et al.* 2017, Chenoweth *et al.* 2017). Herring targeted by Southeast Alaska whales in Lynn Canal were lipid-rich, with energy content ranging from 7.3 to 10.0 kJ/gram (Vollenweider *et al.* 2011). The local distribution of humpbacks in Southeast Alaska appears to be correlated with the density and seasonal availability of prey, particularly herring and euphausiids (Moran *et al.* 2018). Important feeding areas include Glacier Bay and adjacent portions of Icy Strait, Stephens Passage/Frederick Sound, Seymour Canal, Lynn Canal, and Sitka Sound. During autumn and winter, the non-breeding season, humpbacks remaining in Southeast Alaska target areas where herring and eulachon (*Thaleichthys pacificus*) are abundant, such as Seymour Canal, Berners Bay, Auke Bay, Lynn Canal, and Stephens Passage (Krieger and Wing 1986, Moran *et al.* 2018). Over 2,940 and 2,019 humpback whale foraging-days were documented in Lynn Canal alone in the 2007-2008 and 2008-2009 winter seasons, respectively (Moran *et al.* 2018).

4.1.5 Hearing Ability

Humpback whales live in an acoustic world. Humpbacks produce a variety of vocalizations ranging from 20 Hz to 10 kHz to locate prey, coordinate communal feeding efforts, attract mates, and for mother-calf communication (Au *et al.* 2006, Vu *et al.* 2012). NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 35 kHz (NMFS 2016). Depending on its strength and duration, anthropogenic noise can result in social disturbance, physical discomfort, and masking of intraspecific humpback communication. Although difficult to detect visually, evidence that individual humpbacks are responding to elevated noise levels has been inferred by whales leaving/avoiding ensonified areas and reducing the duration and frequency of intraspecific vocalizations (NRC 2005, Nowacek *et al.* 2007). Humpback whales use singing as a form of underwater communication at their wintering grounds for mating and seasonally at feeding grounds, like the Aleutian Islands (Fleming and Jackson 2011). Loud underwater noises, such as those from seismic surveys and pile driving, can result in humpback whales adjusting their acoustic behavior in ways like altering song length (Fleming and Jackson 2011).

4.1.6 Humpback Whale Critical Habitat

No critical habitat has officially been designated for the humpback whale in Alaskan waters, however critical habitat was proposed within the action area on October 9, 2019 by NMFS. A final determination on critical habitat will be forthcoming and is anticipated to be published in October of 2020. The proposed action will be complete prior to October of 2020 when NMFS expects the final rule to be published. Should the action be unable to be completed by the end of September, the termination of the IHA authorization period, consulation will be reinitiated and reauthorization will be requested. Therefore, for the purposes of the application, critical habitat for humpback whales is not considered further.

4.2 Steller Sea Lion (*Eumetopias jubatus*)

4.2.1 Status

The Steller sea lion was listed as a threatened species under the ESA in 1990 following declines of 63% on certain rookeries since 1985 and declines of 82% since 1960 (55 FR 12645). In 1997, two DPSs of Steller sea lion were identified based on differences in genetics, distribution, phenotypic traits, and population trends (Fritz *et al.* 2013, 62 FR 24345). These DPSs are the Eastern U.S. DPS (which includes animals east of Cape Suckling, Alaska (144°W)) and the Western U.S. DPS (including animals at and west of Cape Suckling and within the project area in Dutch Harbor). The Eastern U.S. DPS was recently delisted under the ESA, while the Western U.S. DPS remains listed as endangered (62 CFR 30772; Allen and Angliss, 2010).

In 2014 Steller sea lions had a worldwide population estimated at 142,360-157,498 animals (Allen and Angliss 2014). The Eastern DPS (eDPS) population counts continued to increase during the same period and was removed from ESA listing in 2013 (78 FR 66140). The eDPS of Steller Sea Lions is protected under the MMPA but is not a strategic or depleted species.

The Western DPS (wDPS) is listed as endangered under the ESA and is a depleted, strategic stock under the MMPA (Muto *et al.* 2019). The population of the Western U.S. DPS declined about 75 percent between 1976 and 1990 (Muto et *al.* 2019). The current abundance estimate for the US portion of the wDPS is 50,983. The overall trend for the wDPS in Alaska is an annual increase of 1.94% for non-pups and 1.87% for pups between 2003 and 2016(Muto *et al.* 2019). Factors that contributed to the decline of the stock include incidental take in fisheries, illegal and legal shooting, predation or certain diseases, climate change, and contaminants (Muto *et al.* 2019).

4.2.2 Distribution

Steller sea lions range throughout the North Pacific Ocean from Japan, east to Alaska, and south to central California (Muto *et al.* 2019). Their range extends around the North Pacific Ocean rim, with most sea lions occupying either rookeries or haulouts, depending on the season. Male sea lions are more likely to disperse beyond their typical habitat, but this primarily occurs after the breeding season (NMFS 2019a). Rookeries are used by adult sea lions for pupping, nursing, and mating during the reproductive season (generally from late May to early July). Haulouts are used by all age classes of both genders but are generally not where sea lions reproduce. At sea, they are seen alone or in small groups, but may gather in large "rafts" at the surface near rookeries and haulouts or foraging sites.

Members of this species are not known to migrate, but individuals disperse widely outside of the breeding season (late May to early July). At sea, Steller sea lions commonly occur near the 656-foot (200-meter) depth contour but have been found from nearshore to well beyond the continental shelf (Kajimura and Loughlin, 1988). Sea lions move on and offshore to pelagic waters for feeding excursions. They are also capable of traveling long distances in a season. Sea lions may make semi-permanent or permanent one-way movements from one site to another (Chumbley *et al.* 1997, Burkanov and Loughlin 2005). Round trip transit of greater than 4,040 miles (6,500 km) by individual Steller sea lions has been documented (Jemison *et al.* 2013).

Steller sea lions are abundant in the action area due to the close proximity of an established haulout (Benjamin Island). Typically the sea lions vacate Benjamin Island mid-July through late-September, however some years individuals have remained. In surveys conducted from 2004 to 2018, Steller sea lions were absent from July 17 through September 28 with the exception of 2013 (personal communication with Lauri Jemison, ADF&G). However, Steller sea lions were observed at Benjamin Island on (3) separate occasions in 2005 and 2013 during the project timing. The average number of animals present at the haul out during the project timing was 248

(Table 5). This is consistent with observation of local naturalists who indicate they typically are absent from Benjamin Island starting late July and throughout August.

Table 5. Steller Sea Lion Counts Late July through Early September[1]

Date	Location	Count
7/16/2005	Benjamin Island	560
8/9/2013	Benjamin Island	40
9/24/2013	Benjamin Island	144
	Average	**248**

4.2.2.1 Eastern DPS

The eDPS stock is commonly found in the project area waters and were most recently surveyed in Southeast Alaska in June-July of 2015. The current population estimate for the US eDPS stock is 41,638 individuals. In Southeast Alaska the estimated total abundance is 28,594 individuals of which 20,756 are non-pups and 7,838 are pups (Muto *et al.* 2019). The eDPS has been increasing between 1990 to 2015 with an estimated annual increase of 4.76% for pups and 2.84% for non-pups (Muto *et al.* 2019).

4.2.2.2 Western DPS

The wDPS generally occurs west of Cape Suckling (144° W longitude), and the eDPS generally occurs east of the Cape with the centers of abundance and distribution being located in the Gulf of Alaska and Aleutian Islands. However, while the wDPS is less likely to occur in the action area, it is possible.

The geographic and genetic interplay between the wDPS and the eDPS needs to be understood to gauge potential project impacts in the action area on the endangered wDPS. Long movements by individual Steller sea lions on either side of the 144° W demarcation have occurred, and wDPS individuals have been documented in Southeast Alaska, especially north of Sumner Strait (Jemison *et al.* 2013). Most Steller sea lions in the action area are expected to be from the eDPS but small numbers of wDPS animals also inhabit these waters (Jemison *et al.* 2013). However, it is not possible to visually distinguish between the two DPSs without brandings.

Since 1988, ADF&G has branded a sample of Steller sea lion pups born on Southeast Alaska rookeries as a means of studying the life history and movements of this population. Temporal and regional re-sights of branded SSLs have helped document a degree of mixing of eDPS and wDPS Steller sea lions in Southeast Alaska waters (Jemison *et al.* 2013).

Only three individual, branded wDPS Steller sea lions have been observed at Benjamin Island, the closest haulout, from 2003-2006 with a maximum of 3 sightings per individual. No branded wDPS individuals have been observed in the ADF&G surveys from 2007-2016. The 2007 ADF&G surveys offer the most abundant data for Steller sea lion counts at Benjamin Island. A total of 11 surveys were conducted between January and July 2007, ranging from 0-768 Steller sea lions, with an average count of 404 individuals. In 2007 no wDPS animals were observed. While it is possible an individual from the wDPS may be at the Benjamin Island haulout, it is rare, and none have been documented at this haulout for the last decade (Jemison pers. comm. 2017).

Although recent data in the northern part of the eastern DPS indicate movement of western sea lions east of the 144° line, the mixed part of the range remains small (Jemison *et al.* 2013) and the overall discreteness of the

[1] Unpublished data from ADF&G (personal communication with Lauri Jemison, ADF&G)

eDPS from the wDPS remains distinct. Based on observations by ADF&G over the last decade, it is possible some members of the wDPS may be impacted as wDPS individuals have been documented at Benjamin Island. It is estimated that 1.4% of Steller sea lions found in the Lynn Canal area are from the wDPS (Hastings *et al.* 2020) and for the purposes of the application this estimate will be used to estimate the percentage of takes of the wDPS.

4.2.3 Reproduction and Breeding

The breeding range extends along the northern edge of the Pacific Ocean from the Kuril Islands, Japan, through the Aleutian Islands and Southeast Alaska, south to California (Loughlin *et al.* 1984).

4.2.4 Foraging

Steller sea lions are opportunistic predators, feeding primarily on a wide variety of fishes and cephalopods (e.g., capelin, cod, herring, mackerel, Pollock, rockfish, salmon, sand lance, etc.), bivalves, cephalopods (e.g., squid and octopus) and gastropods (Pitcher 1981; Merrick *et al.* 1997). On rare occasions, Steller sea lions prey on seals and possibly sea otter pups.

Their diet may vary seasonally depending on the abundance and distribution of prey. Womble *et al.* (2009) found that "a reasonable annual foraging strategy for Steller sea lions is to forage on herring (*Clupea pallasii*) aggregations in winter, spawning aggregations of forage fish in spring, salmon (*Oncorhynchus spp.*) in summer and autumn, and Pollock (*Theragra chalcogramma*) and Pacific hake (*Merluccius productus*) throughout the year." They may disperse and range great distances to find aggregated prey but are not known to migrate. Steller sea lions can dive to approximately 1,300 feet (400 meters) in depth to exploit deep prey resources (Rehberg and Zimmerman 2008).

4.2.5 Hearing Ability

Steller sea lion's hearing sensitivity is similar to that of other otariids. Steller sea lion aerial hearing ability ranges from approximately 0.25-30 kHz; however, hearing of one individual was found to be most sensitive to noise from 5-14.1 kHz (Muslow and Reichmuth 2010). Underwater, Steller sea lion best hearing range has been measured at from 1-16 kHz in a male individual and maximum hearing sensitivity of a female individual at 25 kHz, showing a marked sexual dimorphism (though hearing characteristics may also vary based on age or size of the individual). Steller sea lions use both aerial and underwater vocalizations during breading, territorial disputes, and rearing of pups (Kastelein *et al.* 2005).

NMFS categorizes Steller sea lions in the Otariid Pinniped functional hearing group, with an applied frequency range between 60 Hz and 39 kHz (NMFS 2016).

4.2.6 Steller Sea Lion Critical Habitat

Critical habitat has been designated within the action area at Benjamin Island which is a mjor haulout utilized by Steller sea lions. Critical habitat also inlcudes an aquatic, terestrial and air zone extending 3,000 feet (.9 km) from the major haulout (58°3 3.5' N, 134°54.5' W). The project is located east of the 150° and as such there are no restrictions on vessel or human access within designated critical habitat. The designated critical habitat within the action area consists of the aquatic zone around a major haulout. This critical habitat appears to be healthy and intact as it continues to provide foraging habitat, prey resources and refuge habitat considered essential to the conservation of Steller sea lions even with the occurrence of some activities, such as vessel traffic, that may affect essential habitat. However, while the habitat appears to be healthy, based on the constinued use of the haulout, there are no known studies of the current condition of the critical habitat at Benjamin Island at the time

of this application. Activities in the area, occuring independently of the proposed action, inlcude wildlife viewing, commercial fishing, boat/airplane traffic, recreational/subsistence fishing and coastal development.

No physical alterations will be made within designated ciritcal habitat, however elevated noise levels will extend into critical habitat during construction. The closest edge of the float to Benjamin Island is located approximately 3,100 feet from the closest portion of Benjamin Island, just outside of designated critical habitat (7). However, sound effects associated with construction will extend into the designated critical habitat. In order to minimize impacts to Steller sea lions, construction will be timed when Steller sea lions are typically absent from Benjamin Island as discussed further in Sections 4.2.2 and 11.

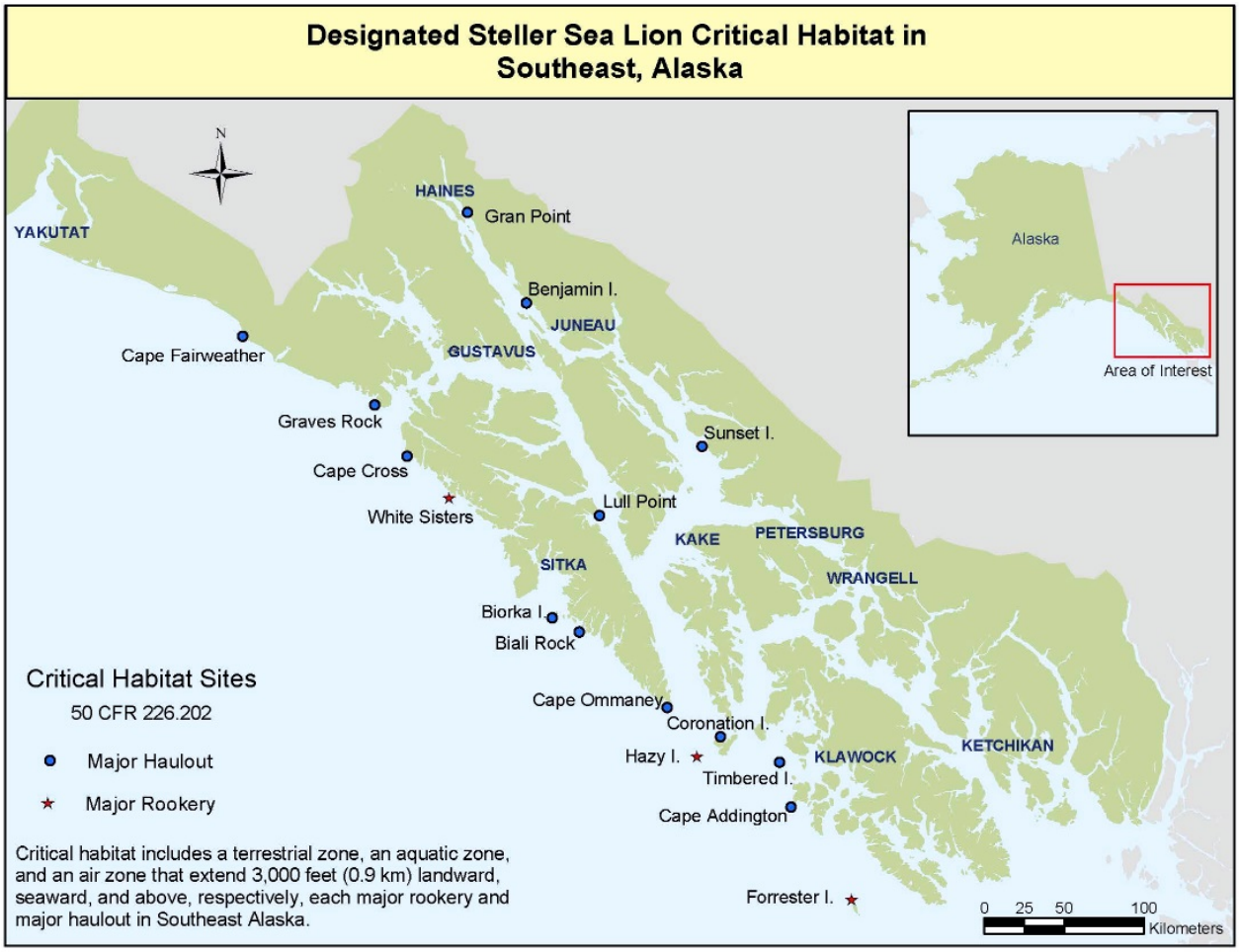

Figure 7. Steller Sea Lion Critical Habitat Sites in Southeast Alaska

4.3 Harbor Seal (*Phoca vitulina*)

4.3.1 Status

The harbor seal is protected under the MMPA but is not listed as a strategic or depleted species under the MMPA (Muto *et al.* 2019). The Harbor seal is not listed as threatened or endangered under the ESA.

The total statewide abundance estimate is 205,090 seals based on surveys taken between 1998 and 2011 (Muto *et al.* 2019). In the northeast Pacific, twelve stocks of harbor seals have been identified by NMFS, ranging from

Baja California to the Aleutians and north to Cape Newman and the Pribilof Islands (Allen and Angliss 2014). Within Alaska there are a total of 12 stocks of harbor seals ranging along the coastal waters from the eastern coast of the Aleutian Islands to Cape Muzon in Southeast Alaska.

The Lynn Canal/Stephens Passage stock is found in the project area waters. The current population estimate for the Lynn Canal/Stephens Passage stock is 9,478 individuals, and the five-year trend estimate is -176. The probability of decrease of this stock is 0.71, suggesting that the stock is declining (Muto *et al.* 2019). Only the Lynn Canal/Stephens Passage stock is considered in this application as it is the only stock present within the action area.

4.3.2 Distribution

Harbor seals are found in coastal and estuarine waters ranging from Baja California to the eastern Aleutian Islands of Alaska. Harbor seals often inhabit nearshore coastal waters and are considered non-migratory, typically staying within 15 to 31 miles of their home. Typically harbor seals will stay within 16 miles (25 km) of shore, but they have been found up to 62 miles (100 km) from the shore (Klinkhart *et al.* 2008).

Up to 44% of their time is spent hauled out, with hauling out occurring more often during the summer (Pitcher and Calkins 1979; Klinkhart *et al.* 2008). Harbor seals haul out in groups of 30 or less but have been known to rarely haul out in numbers of several hundred. There are no defined haulout locations for harbor seals as harbor seals will haul out where conditions are preferable to rest, give birth, and/or molt (Sease 1992).

Harbor seals use a variety of terrestrial sites to haul out for resting (year-round), pupping (May-July), and molting (August-September) including tidal and intertidal reefs, beaches, sand bars, and glacial/sea ice (Sease 1992; Klinkhart *et al.* 2008). Some sites have traditional/historic value for pupping and molting while others are used as temporary resting sites during seasonal foraging trips.

NOAA 2018 abundance estimates for the unit in which the action area is located is 42.06 harbor seals at a haulout on the east coast of Sentinel Island (Figure 8), based primarily off of surveys conducted during the month of August (NOAA 2018). Because surveys were conducted during the limited authorization period (mid-July to late-September) these estimates are considered the best available information for harbor seal abundance during this time. Two other harbor seal haulouts are present in the vicinity, however they are located north of Benjamin Island and are outside of the action area. However, these surveys were last conducted in 2011 and due to the molting season during which the project may occur it is anticipated the majority of seals will be present at the haulout. The estimated abundance was 43 harbor seals while the upper 95th percentile estimate for the unit is 134 harbor seals. While this number does not correlate with the maximum number of seals in the survey unit, it is used to determine the number of harbor seals that may be exposed to elevated noise levels. This is considered a conservative estimate as the survey unit extended north of the project site to the southern end of Berners Bay, and thus encompassed several other haulouts located outside of the action area. Thus it assumed the project will impact a maximum of 135 harbor seals per day of activity on the project.

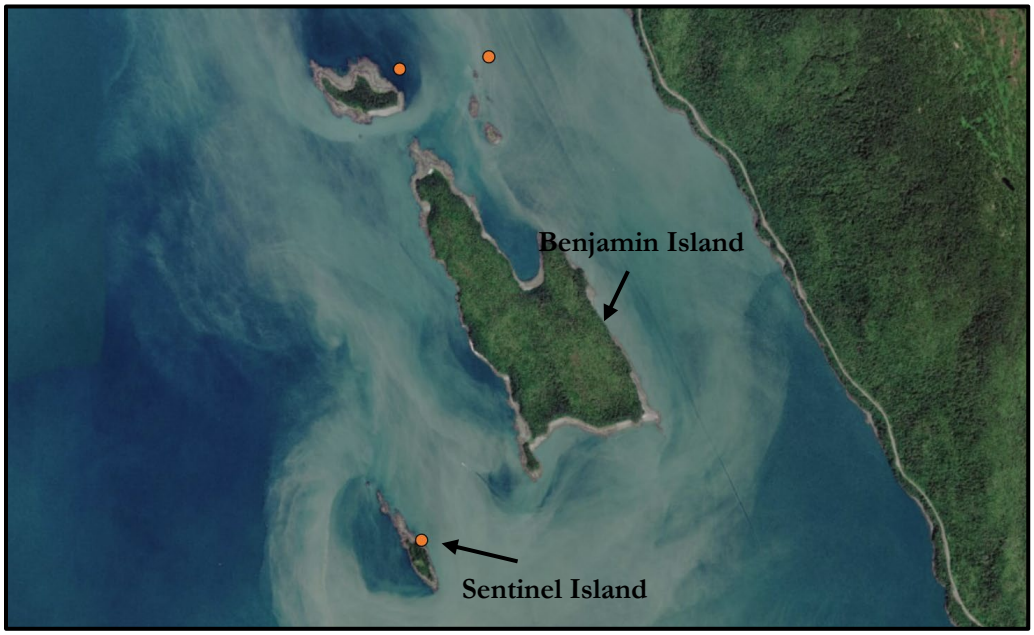

Figure 8. Harbor Seal Haulouts

4.3.3 Reproduction and Breeding

In Alaska, harbor seals typically give birth to single pups between May and mid-July (Klinkhart *et al.* 2008). Pupping and weaning coincide with the summer haulout and the weaning process is completed by July (Sease 1992). The birthing location of harbor seal pups occurs at many different haul-out sites and is not restricted to a few major rookeries (Klinkhart *et al.* 2008).

4.3.4 Diving and Foraging

Harbor seals commonly dive to depths that are less than 20 meters but are capable of reaching depths of up to 1640 feet (500 meters). Harbor seals can remain submerged for over 20 minutes, although most dives are less than 4 minutes long (Klinkhart *et al.* 2008) with approximately 90% of dives being less than seven minutes (Gjertz *et al.* 2001; Eguchi and Harvey 2005). The maximum recorded dive time is 32 minutes (Eguchi and Harvey 2005)

Harbor seals commonly eat walleye Pollock (*Theragra chalcogramma*), octopus (*Octopus spp.*), capelin (*Mallotus villosus*), herring (*Clupea pallasii*), and pacific cod (*Gadus macrocephalus*). Pups usually eat small fishes (Pitcher and Calkins 1979).

4.3.5 Hearing Ability

The hearing range of harbor seals extends above 60 kHz (Jacobs and Terhune 2002) although their hearing is most acute below 60 kHz (Kastelein *et al.* 2009). Harbor seals are more sensitive to lower frequency sounds with the highest sensitivity occurring at 32 kHz in water and 12 kHz in air (Terhune and Turnball 1995, Kastak and Schusterman 1998, Wolski *et al.* 2003). Harbor seals are considered part of the Phocid Pinniped hearing group (NMFS 2016).

4.4 Dall's Porpoise (*Phocoenoides dalli*)

4.4.1 Status

The Dall's porpoise is not designated as a depleted or strategic species under the MMPA, nor are they listed as threatened or endangered under the ESA. Only one stock of Dall's porpoise is currently recognized in Alaskan waters – the Alaska stock – with an estimated abundance of 83,400, although this estimate is outdated (Muto *et al.* 2019). While the Dall's porpoise is generally considered abundant, there is insufficient data on population trends to determine whether the population is stable, increasing or decreasing (NMFS 2019b).

4.4.2 Distribution

Dall's porpoises are widely distributed in the North Pacific Ocean, usually in deep oceanic waters (>600 ft/183 m), over the continental shelf or along slopes (NMFS 2019b, Muto *et al.* 2019). They can be found along the west coast of the United States ranging from California to the Bering Sea in Alaska (NMFS 2019b).

Dall's porpoise are typically found in waters in excess of 600 feet (183 meters) deep, favoring pelagic and inland waters. Most of the waters in the action area are shallower, however just south of Sentinel Island and north of Shelter Island there are small areas, on the edge of the Level B harassment isopleth, where depths exceed 600 feet (183 meters). Dall's porpoise may also be found in habitats not typically utilized by this species including bays, shallow water, and nearshore areas as Moran *et al.* (2018b) recently mapped in Prince William Sound. This species also has a tendency to bow-ride with vessels and both commercial and recreational vessels are prevalent in the action area during the construction window.

Dall's porpoise have exhibited strong seasonal patterns with the highest abundance being present in the spring (April/May), decreasing in the summer (June/July/August) and reaching the lowest in fall (September/October) (Jefferson *et al.* 2019). Group sizes were generally small, under 5 individuals, and during the summer months the mean group size was 2.6. Density estimates were determined for all of Southeast Alaska for each survey year based on season, however densities specific to the Lynn Canal/Favorite Channel area are not available. Surveys occurred closest to the project area in 1991, 1992, and 2007 where densities (porpoises/100km^2) during summer months were reported to be 18.5, 14.3, and 17.8 (Dahlheim *et al.* 2009).

4.4.3 Reproduction and Breeding

Dall's porpoises can be found in Alaskan waters year-round (Muto *et al.* 2019) and typically give birth between June and September to single calves (NMFS 2019b).

4.4.4 Foraging

Dall's porpoises feed on small schooling fish, mid- and deep-water fish, cephalopods, and crustaceans. Their prey includes anchovies, herring, hake, mytophids, smelts, squid, octopus, crabs, and shrimp (NMFS 2019b).

4.4.5 Hearing Ability

Dall's porpoises communicate through generation of clicks at the 165 to 175 kHz range and have a general hearing range between 275 Hz and 160 kHz (NMFS 2016). They are considered part of the high-frequency cetacean hearing group.

4.5 Harbor Porpoise (*Phocoena phocoena*)

4.5.1 Status

The Southeast Alaska stock of harbor porpoise is not designated as depleted under the MMPA nor listed as threatened or endangered under the ESA but is considered Strategic due to human-induced mortality (Muto *et al.* 2019).

4.5.2 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. NMFS currently acknowledges three stocks of harbor porpoise within this range (Muto *et al.* 2019), with the one encompassing the action area – the Southeast Alaska stock – ranging from Dixon Entrance to Cape Suckling. This stock is estimated to include 975 individuals based on 2010-2012 surveys (Muto *et al.* 2019).

The harbor porpoise frequents nearshore waters and coastal embayments throughout their range, including bays, harbors, estuaries, and fjords less than 650 feet (198 m) deep (NMFS 2019c).

Dahlheim *et al.* (2015) reported that the highest densities of harbor porpoise were consistently found in two areas: 1) near Glacier Bay and Icy Strait and 2) Around Zamobo Island/Wrangell. It was estimated that the abundance of harbor porpoises in these areas comprised 75-88% of harbor porpoise abundance throughout the study area[1] in the inland waters of Southeast Alaska. The Dahlheim *et al.* (2015) estimate of harbor porpoise density in Lynn Canal was 0.2 individuals/km^2.

4.5.3 Reproduction and Breeding

Harbor porpoises are believed to typically mate during summer months and give birth between May and July, however very little is known about their reproduction and breeding (NMFS 2019c).

4.5.4 Foraging

Harbor porpoises forage primarily on Pacific herring, other small schooling fishes, and cephalopods and will occasionally feed on squid and octopus (NMFS 2019c). In Southeast Alaska, large numbers of harbor porpoise may form temporary feeding aggregations in areas of localized prey concentration, such as Icy Strait and Sumner Strait (Muto *et al.* 2019).

4.5.5 Hearing Ability

Based on their hearing capacity, Harbor porpoise are considered to be in the high frequency functional hearing group, with assumed sensitivity matching sound they generate (NMFS 2016). The best estimate for harbor porpoise hearing ranges from 16 to 140 kHz with maximum sensitivity occurring between 100 and 140 kHz. The peak frequency produced by harbor porpoises for echolocation is 120 to 130 kHz, which corresponds with the maximum sensitivity range.

[1] The study area included all major waterways from the Glacier Bay area to lower Clarence Strait. These included Icy Strait, Lynn Canal, Chatham Strait, Stephens Passage, Fredrick Sound and Sumner Straight, all of which were surveyed each year between 1991 and 2007. Many smaller bays, inlets and passages adjacent to the previously listed major waterways were surveys when time permitted but not every year.

4.6 Killer Whale (*Orcinus orca*)

4.6.1 Status

NMFS considers three stocks of killer whales to occur in southeast Alaskan waters, which may occur separately or concurrently within the project area. These stocks are the Eastern North Pacific/Alaska Resident stock (2,347 individuals), Eastern North Pacific/Northern Resident stock (261 individuals), the West Coast Transient stock (243 individuals) (Muto *et al.* 2019). These stocks represent two of the three ecotypes of killer whales occurring within the North Pacific Ocean – resident (forages on fish) and transient (forages primarily on marine mammals). However, NMFS is evaluating new genetic information that will likely result in a revision of the above stock structure (Muto *et al.* 2019). The killer whale is protected under the MMPA, but none of these stocks are listed as a strategic or depleted species under the MMPA nor is it listed as threatened or endangered under the ESA.

4.6.2 Distribution

Killer whales are found in every ocean of the world (NMFS 2019d) and are the most widely distributed marine mammal (Allen and Angliss 2014). Killer whales occur commonly within the waters of the project area and are observed within the project area several times annually. Occurrences could include members of one or more of the three designated stocks occurring in the project area: Eastern North Pacific, Northern Residents, (2) Eastern North Pacific, Alaska Residents, and (3) West Coast Transients. Killer whales have been observed during all months in the Juneau vicinity, including Lynn Canal/Favorite Channel. Data compiled by Oceanus Alaska found an average of 25 killer whales in the Statter Harbor area of Auke Bay each year. Data did not make distinctions between the stocks and thus the ratio between stocks is unknown. However, the AG resident pod is one pod known to frequent the Juneau area (Dahlheim *et al.* 2009; B. Lambert personal observation) and has 41 members recorded in the North Gulf Oceanic Society's Identification Guide (NGOS 2019). This pod is seen in the area intermittently in groups of up to approximately 25 individuals (B. Lambert personal observation), consistent with the data for the area. Dahlheim *et al.* (2009) found the average group size of resident orcas to be approximately 33 individuals during the summer (June/July) and 20 during the fall (September/October).

Transient killer whales tend to transit through Lynn Canal and occasionally enter Auke Bay to target local harbor seal, harbor porpoise, or Steller sea lion populations, but do not linger in the Project area (B. Lambert personal observation and 83 FR 52394). Two transient males were observed on August 11, 2019 in the southern portion of Favorite Channel transiting north (B. Lambert personal observation). The same two males, were observed hunting in this area the previous day (B. Lambert personal communication with Aaron Lambert, Alaska Tails). While these observations provide insight into the populations that are present in the action area, the sightings are opportunistic and other waterways nearby were not traveled. Transient orcas have been observed in nearby waterways as well, and one group of 14 individuals were observed during surveys (Dahlheim *et al.* 2009). However, while one group of 14 was encountered once in 1992, the average group size for transient killer whales was 5 during the summer and 4 during the fall.

4.6.3 Reproduction and Breeding

Killer whales do not have a distinct breeding season and their birthing rate is not well understood, however it is estimated that killer whales will give birth once every five years (NMFS 2019d).

4.6.4 Foraging

Killer whales have no natural predators and are known as the top carnivores currently living on the planet (Pitman 2011). The species has the most varied diet of all cetaceans; however, the transient populations typically hunt marine mammals while the resident populations feed on fish, particularly salmon and Atka mackerel

(Barrett-Lennard *et al.* 2011, Parsons *et al.* 2013). Residents often travel in much larger and closer groups than transients and have been observed sharing fish they catch. Transient killer whales feed on other marine mammals including Steller sea lions, harbor seals, and various species of cetaceans. They are also more likely to rely on stealth, making less frequent and less conspicuous calls and skirting "along shorelines and around headlands" in order to hunt their prey in highly coordinated attacks (Barrett-Lennard *et al.* 2011).

4.6.5 Hearing Ability

Killer whales rely on underwater sound for a variety of reasons including navigation, feeding, and communication. Killer whales use echolocation to assist with food gathering — transient killer whales use it rarely and most likely for hunting, while resident whales use it to locate salmon (Au *et al.* 2004). Killer whale social signals resemble the sound of mid-range tactical sonar (Southall *et al.* 2007), with signals commonly occurring as pulsed calls, whistles, and clicks (Szymanski *et al.* 1999). Increases in noise levels near killer whale habitat, like that associated with increasing vessel traffic, have been found to result in an increase in the duration of killer whale calls (Foote *et al.* 2004 as cited in Southall *et al.* 2007). Killer whales are part of the mid-frequency cetacean functional hearing group, with their estimated auditory bandwidth between 150 Hz and 160 kHz (Southall *et al.* 2007).

4.7 Minke Whale (*Balaenoptera acutorostra*)

4.7.1 Status

The minke whale is protected under the MMPA but is not listed as a strategic or depleted species. Minke whales are also not listed as threatened or endangered under the ESA, although no abundance estimates are available for minke whales (Muto *et al.* 2019). The minke whales population status is considered stable and they are the most abundant rorqual, or "great whale", in the world (NMFS 2019e)

4.7.2 Distribution

Minke whales are widely distributed throughout the northern hemisphere and are found in both the Pacific and Atlantic oceans. Minke whales in Alaska are considered migratory and during summer months are typically found in the Arctic and during winter months are found near the equator (NMFS 2019e). There are no known occurrences of minke whales within the action area, however since their ranges extend into the project area and they have been observed in southeast Alaska (Dahlheim *et al.* 2009) it is possible the species could occur near the project area.

4.7.3 Reproduction and Breeding

Minke whales are believed to calve in the winter months (NMFS 2019e), however little is known about their breeding areas.

4.7.4 Foraging

Minke whales feed by side-lunging through schools of prey and are opportunistic predators feeding on a variety of crustaceans, plankton, and small school fish (NMFS 2019e).

4.7.5 Acoustic Ecology

Minke whales have a generalized hearing range of 7 Hz to 35 kHz and fall under the Low-frequency Cetacean hearing group (NMFS 2019e).

5 Type of Incidental Take Authorization Requested

Under Section 101(a)(5)(D) of the MMPA, GCHS requests an IHA for takes by Level A harassment (i.e., non-serious injury or permanent [hearing] threshold shift) and Level B harassment (i.e., behavioral disturbance or temporary [hearing] threshold shift) (NMFS 2018b) during certain operations associated with the construction of the proposed project. GCHS requests an IHA with an effective date of July 15, 2020 and valid through September 20, 2020. If work is not completed at the end of that period, GCHS would request an IHA renewal.

Take is requested for the following activities;

- Drilling, impact pile driving and vibratory pile driving activities (as described in Section 1.3 and combined with the mitigation measures described in Section 11) have the potential to take permitted marine mammals by Level B harassment resulting in behavioral disturbance or temporary threshold shift (TTS) due to the effects of increased underwater noise levels.
- Impact pile driving (as described in Section 1.3 and combined with the mitigation measures described in Section 11) has the potential to take permitted marine mammals by Level A harassment resulting in permanent threshold shift (PTS) or non-serious injury.
- During impact and vibratory pile driving activities the project has the potential to increase airborne noise levels for pinnipeds hauled out along the shoreline of Lynn Canal/Favorite Channel. Airborne impact isopleths are substantially smaller than underwater impact isopleths for the same activities, so it is likely that any takes from airborne noise would already be accounted for in estimates for underwater noise impacts. Known harbor seal and Steller sea lion haulouts are located outside of the airborne disturbance isopleths.

The noise levels and potential impact isopleths that are expected to result from the construction of this project are described in detail in the sections below. Mitigation measures (including operational shutdown and monitoring zones) will be incorporated into the project to minimize the potential for unauthorized injury or harassment. Protocols for observations and mitigation methods are discussed in Section 11 and in Appendix B. Takes of non-permitted species will be prevented by the mitigation measures described in Section 11.

5.1 Method of Incidental Taking

The Sentinel Island Access Float project includes drilling and vibratory pile driving in an area where marine mammals are commonly observed. Use of impact hammers is not anticipated, however analysis is included as it is possible actual conditions encountered in the field may necessitate the use of impact hammers. Impact hammers may also be used briefly to seat the pile in the drilled socket if necessary. Planned construction methodologies will temporarily increase the underwater and airborne noise within the project area. This increase in noise has the potential to result in the behavioral disturbance, hearing threshold shifts, or non-serious injury of marine mammals in the vicinity of the construction project.

5.2 Regulatory Thresholds for Marine Mammal Take

Unless otherwise noted, the following notations will be used to express thresholds:

- Peak Sound Pressure Level (SPL_{PK}): The maximum absolute value of the instantaneous sound pressure that occurs during a specified time interval, measured in dB re: 1 µPa (e.g., 198 dB_{PEAK}). (Caltrans 2015)
- Average Root Mean Square Sound Pressure Level (SPL_{RMS}): A decibel measure of the square root of mean square pressure. For pulses, the average of the squared pressures over the time that comprises

that portion of the wave form containing 90 percent of the sound energy of the impulse in dB re: 1 µPa (for underwater) and in dB re: 20 µPa is used (e.g., 185 dB_{RMS}). (Caltrans 2015)

- Sound Exposure Level (SEL): The integral over time of the squared pressure of a transient waveform, in dB re: 1 μPa^2–sec. (e.g., 173 dB_{SEL}). This approximates sound energy in the pulse. (Caltrans 2015)
- Cumulative Sound Exposure Level (SEL_{CUM}): Cumulative exposure over the duration of the activity within a 24-hr period. (NMFS 2018b)

5.2.1 Updated Cumulative Sound Threshold Guidance, PTS

Determination of the cumulative underwater sound exposure levels (SEL_{CUM}) required to cause PTS in marine mammals within the project area was based on the technical guidelines published by NMFS on August 03, 2016 and revised in April, 2018. This guidance considers the duration of the activity, the sound exposure level produced by the source during one working day, and the effective hearing range of the receiving species. Regulatory thresholds for potentially affected species, measured in one-day SEL_{CUM}, are summarized below.

Table 6. SEL_{CUM} PTS Onset Thresholds. (NMFS 2018b)

UNDERWATER - (dB re: 1 μPa^2 s)					
Source	**Low-Frequency (LF) Cetaceans[1]**	**Mid-Frequency (MF) Cetaceans[2]**	**High-Frequency (HF) Cetaceans[3]**	**Phocid Pinnipeds (PW)[4]**	**Otariid Pinnipeds (OW)[5]**
Non-impulsive Noise	199	198	173	201	219
Impulsive Noise	183	185	155	185	203

Calculation of impact isopleths under the new guidance utilized the methods presented in Appendix D of the *2018 Revision to Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing* and the most recent version of the associated User Spreadsheet Tool (NMFS 2018b). The spreadsheet accounts for effective hearing ranges using Weighting Factor Adjustments (WFAs), and this application uses the recommended values therein. Activity durations were estimated based on similar project experience.

5.2.2 Updated Peak Sound Threshold Guidance, TTS and PTS

In addition to thresholds for cumulative noise exposure, onset thresholds for peak sound pressures must be considered for impulsive sources. Peak sound pressure level (SPL_{PK}) is defined as "the greatest absolute instantaneous sound pressure within a specified time interval and frequency band" (NMFS 2018b).

[1] LF Cetaceans include the humpback whale
[2] MF Cetaceans include the killer whale
[3] HF Cetaceans include the Dall's porpoise and harbor porpoise
[4] PW pinnipeds include the harbor seal
[5] OW Pinnipeds include the Steller sea lion and California sea lion

Table 7. SPL_{PK} Thresholds for Impulsive Noise. (NMFS 2018b)

UNDERWATER - (dB re: 1 µPa)					
Source	**Low-Frequency (LF) Cetaceans**	**Mid-Frequency (MF) Cetaceans**	**High-Frequency (HF) Cetaceans**	**Phocid Pinnipeds (PW)**	**Otariid Pinnipeds (OW)**
TTS Onset	213	224	196	212	226
PTS Onset	219	230	202	218	232

5.2.3 Interim Sound Threshold Guidance

The updated guidance described above does not address behavioral disturbance from underwater or airborne noise. The interim sound threshold guidance, previously published by NMFS and summarized in Table 6, will be used for estimating exposure behavioral disturbance isopleths (NMFS 2015).

Airborne noise thresholds have not been established for cetaceans (NMFS 2015), and no adverse impacts are anticipated from airborne noise to cetaceans in the project area.

Table 8. Behavioral Disturbance Thresholds. (NMFS 2015)

Underwater - (dB re: 1 µPa)		
Source	**Cetaceans & Pinnipeds**	
Non-impulsive Noise	120	
Impulsive Noise	160	
AIRBORNE - (dB re: 20 µPa)		
Source	Harbor Seals	Other Pinnipeds
All Source Types	90	100

Per the interim guidance, the practical spreading loss model was used to determine the zones in which pinnipeds and cetaceans have the potential to face disturbance.

The formula for calculating practical spreading loss in *underwater noise* is:

$$TL = GL \times \log \frac{R_1}{R_0}$$

Where TL is the transmission loss (dB), GL is the geometric loss coefficient (15 is the only value allowed without real-time sound source verification), R_1 is the range to the target sound pressure level (m), and R_0 is the distance from the source of the initial measurement (m).

Per the interim guidance, the spherical spreading loss model was used to determine the zones in which pinnipeds and cetaceans have the potential to face behavioral disturbance from airborne noise.

The formula for calculating spherical spreading loss in *airborne noise* is:

$$TL = GL \times \log \frac{R_1}{R_0}$$

Where TL is the transmission loss (dB), GL is the geometric loss coefficient (standard value=20), R_1 is the range to the target sound pressure level (m), and R_0 is the distance from the source of the initial measurement (m).

5.3 Sources of Anthropogenic Sound

In the Technical Guidance (NMFS 2018b), sound sources are divided as;

- Impulsive: produce sounds that are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay.
- Non-impulsive: produce sounds that can be broadband, narrowband or tonal, brief or prolonged, (continuous or intermittent) and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do.

5.3.1 Underwater Sources

Pile driving noise is conservatively anticipated to be continuous over 12 hour work days, over a total of 6 work days. It is anticipated all of the piles will require drilling for rock sockets and will be installed at the rate of a single pile per day, however it is possible 2 piles could be installed in a day dependent on actual field conditions and the contractor's means and methods. To be conservative and to account for unforeseen circumstances in the field pile driving activities may occur over an estimated total of 6 days.

Underwater harassment zones are summarized in Section 5.4. Permitted pinnipeds and cetaceans that enter the Level B harassment zone for vibratory pile driving/drilling activities will be recorded as exposures. If a non-permitted marine mammal is observed approaching the Level B harassment zone, pile driving/drilling will shut down.

5.3.1.1 Non-Impulsive Sources - Vibratory Pile Driving and Down the Hole Drilling

The closest known measurements of sound levels for vibratory pile installation of 24-inch (61-cm) steel piles are from the U.S. Navy Proxy Sound Source Study for projects in Puget Sound (U.S. Navy 2015). Based on the projects analyzed it was determined that 16- to 24-inch (41- to 61-cm) piles exhibited similar sound source levels for projects in Puget Sound resulting in a recommended source level of 161 dB_{RMS} at 33 feet (10 m) for piles diameters ranging from 16- to 24-inches (41- to 61-cm) (U.S. Navy 2015). The Navy study analyzed a number of pile installations in order to determine proxy values for when site specific information is not available. Because the Navy analyzed a range of pile installation projects to determine conservative proxy sound source levels for piles ranging from 16- to 24-inches (41- to 61-cm), this is considered to be the most applicable to the installation of 24-inch (61-cm) piles at Sentinel Island. For reasons detailed in Section 1.3, noise will be assumed to consist solely of drilling, the more conservative of the noise levels and thus this information is presented for informational purposes only.

Denes *et al.* (2016) measured sound emanating from the drilling of 24-inch (61-cm) piles at Kodiak and calculated a median sound source level SPL of 166.2 dB at 33 feet (10 meters) which was used to calculate the PTS/TTS onset isopleths. Other recent sound source verification data from Skagway is available, however it is solely for the installation of 42-inch (107-cm) diameter piles and thus the Denes *et al.* (2016) is the best available estimate for the installation of drilled rock sockets for 24-inch diameter piles.

Table 9. Parameters for Underwater Noise Calculations

Source	Source Type	Mean SPL_{RMS} (dB re 1 µPa @ 1 m)	Weighting Factor Adjustment	Estimated Duration	
				Hours per Day	Days
Drilling Installation	Non-impulsive, continuous	166.2 dB[a] at 33 feet (10 m)	2.5 kHz	6-12 hours[1] (6 hours/pile)	1-2

([a]Denes *et al.* 2016)

5.3.1.2 Impact Pile Driving

For impact pile driving of 24-inch (61-cm) piles, sound measurements were used from the literature review in Appendix H of the AKDOT&PF study (Yurk *et al.* 2015) for 24-inch (61-cm) piles driven in the Columbia River with a diesel impact hammer. This sound source was used to estimate the sound source levels for installation of the 24-inch (61-cm) at Sentinel Island.

Table 10. Parameters for Impulsive Underwater Noise Calculations

Source	Source Type	Pile Size	Sound Pressure Level	Peak Level	Single Strike SEL	Weighting Factor Adjustment	Estimated Duration		
							Piles per Day	Strikes Per Pile	Ant. Days of Effort
Impact Hammer	Impulsive	24-inch (61-cm)	190 dB_{RMS}[a] at 33 ft (10 m)	205 dB at 33 ft (10 m)	175 dB[a] at 33 ft (10 m)	2 kHz	0-2	250	0-4[2]

([a]Yurk *et al.* 2015)

5.3.2 Airborne Sources

Data for vibratory driving of 30-inch (76-cm) piles from Laughlin (2010) was measured at 96.4 dB_{L5EQ} at 49.2 feet (15 m). In this case, dB_{L5EQ} (or the 5-minute average continuous sound level) was considered equivalent to dB_{RMS} values, which would be calculated in a similar fashion. Data for airborne sources for 24-inch (61-cm) piles

[1] In order to conservatively assess impacts it is assumed that work could take up to 6 days. However, in order to conservatively assess cumulative impacts within a 24-hour period it is assumed that 2 piles could be installed per day, or up to 12 hours of work.
[2] In order to conservatively assess impacts it is assumed that work could take up to 6 days. However, in order to conservatively assess cumulative impacts within a 24-hour period it is assumed that 2 piles could be installed per day, or up to 1000 strikes with the impact hammer.

was not available. Vibratory installation of 24-inch (61-cm) piles is assumed to create lower noise levels than installation of 30-inch (76-cm) piles, so this value was conservatively used for all vibratory pile driving.

Impact driving noise levels were used from a Washington State Department of Transportation (WSDOT) IHA application citing data collected during the Seattle Test Pile Project. Impact driving of 36-inch (91.5 cm) steel piles resulted in noise levels of 111 dB_{RMS} at 49.2 feet (15 m) (WSDOT 2017). Data for smaller piles was not available and the impact installation of 24-inch (61-cm) piles is assumed to create lower noise levels than installation of 36-inch (91.5-cm) piles, so this value was conservatively used for all vibratory pile driving.

Table 11. Parameters for Airborne Noise Calculations

Source	Source Type	Pile Size	Sound Pressure Level
Vibratory Hammer	Non-impulsive, continuous	24-inch (61-cm)	96.4 dB_{L5EQ} at 50 feet (15 m)[a]
Impact Hammer	Impulsive	24-inch (61-cm)	111 dB_{RMS} at 50 feet (15 m)[b]

([a]Laughlin 2010; [b]WSDOT 2017)

5.4 Calculated Impact Isopleths

Table 12. Calculated Isopleths – Underwater Sources

Source	Source Level	PTS Onset Isopleth					Behavioral Disturbance Isopleth
		(LF) Low-Frequency Cetaceans	(MF) Mid-Frequency Cetaceans	(HF) High-Frequency Cetaceans	Phocid Pinnipeds (PW)	Otariid Pinnipeds (OW)	Cetaceans & Pinnipeds
Vibratory Installation/ Drilling	166.2 dB_{RMS} at 33 ft (10 m)[a]	260.8 ft (79.5 m)	23.0 ft (7.0 m)	385.8 ft (117.6 m)	158.5 ft (48.3 m)	11.2 ft (3.4 m)	7.5 miles (12.1 km)
Impact Pile Driving (Steel)	175 $dB_{SS\ SEL}$ at 33 ft (10 m)[b] (single strike)	604.4 ft (184.2 m)	21.7 ft (6.6 m)	720.2 ft (219.5 m)	323.5 ft (98.6 m)	23.7 ft (7.2 m)	3,280 ft (1,000 m)

([a]Denes *et al.* 2016; [b]Yurk *et al.* 2015)

Table 13. Calculated Isopleths – Airborne Sources

Airborne Noise				
Source	**Source Level**	**Level A Harassment Zone (m)**	**Level B Harassment Zone (m)**	
			Harbor Seals	**Steller Sea Lions**
Vibratory Pile Driving	96.4 dB_{L5EQ} at 50 feet (15 m)[a]	N/A	115 feet (35 m)	33 feet (10 m)
Impact Pile Driving	111 dB_{RMS} at 50 feet (15 m)[b]	N/A	492 feet (150 m)	164 feet (50 m)

([a]Laughlin 2010, [b]WSDOT 2017)

Only impact pile driving has peak sound pressures above the PTS threshold. The distance to the peak threshold is outlined in Table 13. All of these zones are well within all established impact pile driving shutdown zones for all marine mammals and thus are not further considered independently.

Table 14. Calculated Isopleths – Peak Sound Pressures for Impact Pile Driving

	Underwater Noise (dB re: 1 µPa)					
Source	**Source Level**	**Low-Frequency (LF) Cetaceans**	**Mid-Frequency (MF) Cetaceans**	**High-Frequency (HF) Cetaceans**	**Phocid Pinnipeds (PW)**	**Otariid Pinnipeds (OW)**
24-inch piles	175 dB[a] at 33 ft (10 m)	3.9 feet (1.2 m)	N/A	51.8 feet (15.8 m)	4.6 feet (1.4 m)	N/A

([a]Yurk *et al.* 2015)

6 Number of Marine Mammals that May Be Affected

The GCHS requests an IHA with an effective date of July 15, 2020 and valid through September 20, 2020 for Level B (behavioral harassment) and Level A takes for MMPA-defined stocks that include animals in the endangered Steller sea lions wDPS and humpback whales from the threatened Mexico DPS. This IHA request covers these ESA-listed species in their respective MMPA-defined stocks and covers anticipated takes of non-ESA listed populations.

The number of marine mammals that may be exposed to harassment thresholds is calculated by estimating the likelihood of a marine mammal being present within a harassment zone during the associated activities. Expected marine mammal presence is determined by past observations and general abundance near the proposed project area during construction.

Based upon the actions described above, their anticipated effect on marine mammals, and number of animals in the project area, we anticipate that a number of animals will be taken by the proposed actions. The estimated number of takes are based upon conservative ranges from the best scientific data currently available for these species near the project area. We *do not* anticipate this many takes will occur, as our avoidance and minimization of impacts efforts on the grounds during the construction activity will be informed, deliberate, focused and integrated throughout all levels of project management and monitoring. A take summary is provided in Table 14 and the basis for these take estimates for each species are provided in Sections 6.1 through 6.7. Further analysis of take numbers and small numbers considerations are located in Section 7.1.

Table 15. Take Request Summary

Species		Number of Takes			Stock Abundance	% of Stock[1]
		Level B	Level A	Estimated Individuals		
Humpback whale	Hawaii DPS	132	N/A	36	10,103	0.36
	Mexico DPS	12	N/A	12	3,264	0.37
Steller sea lion	eDPS	1,467	N/A	1,467	41,638	3.52
	wDPS	21	N/A	21	54,267	0.04
Harbor seal		36,180 takes of 804 individuals	N/A	804	9,478	8.48
Dall's porpoise		44	4	48	83,400[2]	0.06
Harbor porpoise		51	6	57	975	5.85
Killer whale		76	N/A	76	2,651	2.87
Minke whale		1	N/A	1	Unknown	N/A

[1] $\%\ of\ Stock = \frac{Take}{Abundance * 100}$, where a conservative estimate of individuals is used to estimate impact to stock

[2] This abundance estimate is over 8 years old and thus the stock abundance is considered to be unknown. This number is used only to give some context to the requested take numbers.

6.1 Humpback Whale

Based on local information and Dahlheim *et al.* (2009) surveys regarding humpback whale abundance within the action area (Section 4.2.2) and Dahlheim *et al.* (2009) it is estimated that up to 8 individuals could be exposed to underwater noise each day during the 6 days of the project, or a total of 48 individuals. It is likely that some individuals will be exposed more than once during the project, so the total number of individual whales is expected to be fewer than 48. While individual humpback whales can generally be identified, due to the size of the monitoring zone it is possible this won't be the case in some instances. Further, it is possible that different monitors will sight the same whale, given the extent of the monitoring zones and the distances humpback whales can move in a day. Thus it is conservatively assumed that there could be up to 3 interactions with each individual daily, resulting in up to 144 takes of humpback whales.

For purposes of estimating effects and takes of the Mexico DPS of humpback whales, we acknowledge that they cannot be readily distinguished from non-listed humpback whales in the project area and assume that some whales are from the Mexico DPS. Based on the Wade *et al.* (2016) estimates it is predicted that 9 of the exposures will be of the Mexico DPS and 135 will be of the Hawaii DPS. However, the average group size during the fall months was 2 whales (Dahlheim *et al.* 2009) and it is possible that a mother calf pair of the Mexico DPS, or other group of 2 Mexico DPS, whales may occur within the action area each day. Thus it is conservatively assumed that 12 individuals of the threatened Mexico DPS population may be taken.

No Level A takes are requested for humpback whales as the Level A harassment zones are small and shutdown measures can be implemented prior to any humpback whales enter Level A harassment zones.

Table 16. Estimated number of level B takes of humpback whales

Species	Vibratory Pile Driving and Drilling (6 days)
Humpback Whale Hawaii DPS	132
Humpback Whale Mexico DPS (6.1%)	12
	Total Takes (Level B) 144

6.2 Steller Sea Lion

Sightings can be estimated on the assumptions that up to 248 Steller sea lions seals will be present in the Level B harassment zone (see Section 4.2.2).

Using a potential maximum rate, the project could take up to 248 Steller sea lions for each day of pile installation activities due to the large Level B harassment zones. It will be conservatively assumed that no more than 248 individual Steller sea lions will enter the action area on a given day. Steller sea lions are typically absent from the action area during the project timing, however in the instances where they have been present the average number of Steller sea lions was 248. Based on the available information (Table 5) it is unlikely that more will be present during the construction period. The largest number of observed was in the beginning of July in 2005, however the animals vacated Benjamin Island shortly after. Further, even if some animals are present at Benjamin Island, if they are hauled out they will be outside of airborne Level B harassment isopleth and will not be taken. As such, the average count of 248 individuals per day was used to make this determination.

Based on the best information available, as discussed in Section 4.2.2, it is estimated that up to 248 individual Steller sea lions could be exposed to underwater noise each day during the 6 days of the project, or a total of 1,448 individuals. It is conservatively assumed that 248 different individual sea lions will occur in the action area each day, however many will likely be the same individual each day should Steller sea lions be present during construction. In examining small take numbers the 1.4% estimate is applied to the 1,488 individuals that may be in the area, resulting in an estimate of 21 individual wDPS sea lions and 1,467 individual eDPS sea lions.

No Level A takes are requested for Steller sea lions as the Level A harassment zones are small and shutdown measures can be implemented prior to Steller sea lions entering any Level A harassment zone.

Table 17. Estimated number of level B takes of Steller sea lions

Species	Vibratory Pile Driving and Drilling (6 days)
Steller Sea Lion eDPS	1,467
Steller Sea Lion wDPS (18%)	21
	Total Takes (Level B) 1,488

6.3 Harbor Seal

Sightings can be estimated on the assumptions that up to 134 harbor seals will be present in the Level B harassment zone (see Section 4.3.2) and each seal will dive and resurface every 4 minutes (Klinkhart *et al.* 2008) throughout 50% of the project duration. Half of the work duration is used because based on survey data it is likely that the harbor seals will spend some of the time hauled out on the northern portion of Sentinel Island. The known haulout is located outside of all airborne harassment isopleths and no takes will occur if harbor seals are hauled out on the northern end of Sentinel Island.

$$Drilling\ Duration = 6\ piles * 6\ hours = 36\ hours$$

$$Level\ B\ Harbor\ Seal\ Sightings = 134\ harbor\ seals * 36 \frac{hours}{2} * 15\ \frac{sightings}{hour}$$
$$= 36{,}180\ total\ sightings$$

Based on the best information available, as discussed in Section 2.3.2, it is estimated that up to 134 individual harbor seals could be exposed to underwater noise each day during the 6 days of the project, or a total of 536 individuals. A total of 24,120 takes are requested based on the estimated number of sightings of these 536 individuals. While a larger number of takes are requested due to the likely re-sighting of animals this number is used to analyze the small take numbers. Because it is conservatively assumed that 134 different individual harbor seals will occur in the action area each day (134 individuals/day * 6 days = 804 total individuals), it is likely that many will be the same individual(s) each day and thus the actual percentage of the stock taken will likely be even smaller (Table 14).

Members of the GCHS report only rarely seeing harbor seals in the immediate vicinity of Sentinel Island, thus the shutdown zones are small enough to be feasible and no Level A takes are requested.

Using this as a worst case estimate, the project could **result in up to 24,120 total Level B takes of harbor seals.**

6.4 Dall's Porpoise

To estimate the number of animals that may be present within the action area during construction the average density of Dall's porpoise (16.9 porpoises/100 km²) from the Dahlheim *et al.* 2009 surveys was used (see Section 4.4.2). The action area (Figure 4) encompasses an area of 47 km². The project area and the estimated density were used in the following calculations to estimate takes.

$$Dall's\ Porpoise\ Level\ B\ Takes = 47\ km^2 * 16.9 \frac{porpoises}{100\ km^2} * 6\ days = 48\ Level\ B\ Takes$$

Dall's porpoises can generally be observed by monitors due to the "rooster tail" splash often made when surfacing (Wells 2008). However, due to the size of the Level A harassment zone associated with drilling (120 meters), and due to the size of the Level A harassment zones, it is possible Dall's porpoises may enter the Level A harassment zone undetected. It is conservatively assumed that up to (4) harbor porpoises (the mean group size from Dahlheim *et al.* 2009) may enter the Level A harassment once during the duration of the project.

Using this as a worst case estimate, the project could take **up to 48 Dall's porpoises with up to 44 Level B takes and 4 Level A takes.** The Level A takes have been subtracted from the total calculated total for Level B harassment to avoid double counting takes because any animal entering the Level A zone would have already been exposed as counted as Level B takes (48 – 4 = 44).

6.5 Harbor Porpoise

Take is estimated using the Dahlheim *et al.* (2015) estimate of harbor porpoise density in Lynn Canal (0.2 individuals/km²) and the Level B harassment zone. The Level B harassment zone (Figure 4) encompasses an area of 47 km². The project area and the estimated density were used in the following calculations to estimate takes.

$$Harbor\ Porpoise\ Level\ B\ Takes = 47\ km^2 * \frac{0.2\ porpoises}{km^2} * 6\ days = 57\ Level\ B\ Takes$$

Based on the estimated density in Lynn Canal it is estimated that 38 harbor porpoises could be exposed to elevated noise levels during the duration of the project.

Harbor porpoises are stealthy, having no visible blow and a low profile in the water making the species difficult for monitors to detect (Dahlheim *et al.* 2015). The Level A harassment zones extend up to 350 feet (220 m) and because of this distance it is possible harbor porpoises may enter the Level A harassment zone undetected. Applying the density estimate to the area of the Level A harassment zone (0.05 km²) yields a result of 0.01 harbor porpoise takes per day, or 0.06 over 6 days. However, harbor porpoises are most commonly observed in pairs and as such applying the density estimate to such a small area and time scale does not sufficiently address the potential for Level A takes. Because they are most commonly observed in pairs (Dahlheim *et al.* 2009). It is conservatively assumed that one pair of harbor porpoises may enter the Level A harassment zone every other day of pile driving.

$$Harbor\ Porpoise\ Level\ A\ Takes = \frac{6\ days}{2} * 2\ harbor\ porpoises = 6\ Level\ A\ Takes$$

Using this as a worst case estimate, the project could take **up to 57 harbor porpoises with up to 51 Level B takes and 6 Level A takes.** The Level A takes have been subtracted from the total calculated total for Level B harassment to avoid double counting takes because any animal entering the Level A zone would have already been exposed as counted as takes (57 – 6 = 51).

6.6 Killer Whale

Orcas move fast and have large ranges, and while they may occasionally enter the Level B harassment zones they are unlikely to linger in the area. Based on the information available it is conservatively estimated that two interactions with the average group size of residents (33) and two interactions with the average group size of transients (5) may be taken during the duration of the project. As killer whales may not be able to be readily distinguished between resident and transients, or the applicable stock populations, a total of 76 takes of orcas are requested [(33*2)+(5*2)=76)].

Using this as a worst case scenario the project could **result in up to 76 total Level B takes of killer whales.** No Level A takes are requested for killer whales due to the small size of the Level A harassment zones and because killer orcas are generally somewhat conspicuous, shutdown measures will be implemented prior to an orca entering a Level A harassment zone.

6.7 Minke Whale

There are no known occurrences of minke whales within the action area, however since their ranges extend into the project area and they have been observed in southeast Alaska (Dahlheim *et al.* 2009) it is possible the species could occur near the project area. It is estimated up to one minke whale could be exposed to elevated noise levels each month of the project. Therefore, one take is being requested for the duration of the project.

Using this as a worst case scenario, the could take up to 1 minke whale per month, **resulting in up to 1 total Level B take of minke whales.** Due to the unlikely occurrence of minke whales and the ability to shut down pile driving activities prior to one entering the Level A harassment zone, no Level A takes of minke whales are requested.

7 Anticipated Impact on Species or Stocks of Marine Mammals

The proposed project has the potential to impact marine mammals by increasing noise in Favorite Channel/Lynn Canal temporarily during construction and by resulting in an increase in vessel traffic in the area. Increasing vessel traffic is considered in Sections 9 and 10. Marine mammals which may be impacted include the humpback whale, Steller sea lion, harbor seal, Dall's porpoise, harbor porpoise, killer whale and minke whale. Likely effects may include temporary behavioral responses to non-injurious noise from in-water construction activities.

The significance of potential impacts of noise to marine mammals is dependent on a number of factors including the duration and magnitude of sound pressure levels, species receiving the sound, exposure type (e.g., continuous vs. pulse), site characteristics, background noise levels, species' auditory characteristics, and individual marine mammal characteristics (e.g., habituation, season, motivation)(NRC 2003). For most species of marine mammals, there is limited empirical evidence with which to quantify either immediate or long term impacts of construction noise (Ellison *et al.* 2012). Cetaceans exposed to elevated underwater noise levels have been observed to alter their respiration rate (surfacing interval), change direction (away from sound), reduce vocalizations, and/or vacate the ensonified area. Signs of disturbance to pinnipeds include altering their dive depth or course, spending more time hauled out of water or with head above water, and jumping (Kastelein *et al.* 2017). Construction activities will occur in areas frequently ensonified by vessel activity, although ambient levels are not fully understood. Because such activities are temporary in nature, of short duration (6 days), and likely will not kill or marine mammals or their remove prey species available to foraging mammals (see Section 9), we anticipate that both prey species and marine mammals will resume necessary activities to meet their metabolic and life history needs.

Cetaceans are sensitive to underwater noise, while pinnipeds are sensitive to both underwater and airborne noise. Marine mammals can also experience changes in sensitivity to sounds after exposure to intense sounds for long periods. Threshold shifts can occur on a temporary or permanent level, depending on the intensity of the sound and length of time to which the animal is exposed to the sound. Typically, temporary threshold shifts (TTS) include impacts to middle-ear muscular activity, increased blood flow, and general auditory fatigue (Southall *et al.* 2007). At the TTS level, the animals do not experience a permanent change in hearing sensitivity and exhibit no signs of physical injury. A permanent threshold shift (PTS) would occur if the animal subjected to the increased sound level did not return to pre-exposure conditions within an order of weeks or if the animal exhibited physical injuries (Southall *et al.* 2007), however due to shut down and mitigation measures discussed in Section 11 the risk of PTS in any species is extremely low.

Recent studies have shown that even moderate levels of underwater noise can cause a temporary loss in hearing sensitivity in some marine mammals (Kastak *et al.* 2005). Increases in noise levels from in-water activities can reduce a marine mammal's capability to hear other noises, like background noise and noise created by their prey and predators, otherwise known as auditory masking (Southall *et al.* 2007). This results in difficulties with communication, predator avoidance, and prey capture, among others. Anthropogenic sounds can also result in behavioral modification, including changes in foraging and habitat use or separation of mother and infant pairs (MMC 2007).

Besides take associated with this project, other sources of biological removal for marine mammal species generally consist of fisheries related mortality, subsistence uses, illegal shootings, entanglements and vessel strikes (Muto *et al.* 2019). Table 17 summarizes total estimated annual take by species from 2012-2016. Most estimates are considered the minimum due to overlap with foreign waters.

Table 18. Average Annual Mortality of Marine Mammals (2012-2016)[1]

Species		Total Average Annual Mortality (2012-2016)
Humpback whale	Hawaii DPS	3
	Mexico DPS	
Steller sea lion	eDPS	15
	wDPS	247
Harbor seal		50
Dall's porpoise		38
Harbor porpoise		34
Killer whale		Unknown, approximately 1 whale from all stocks per year
Minke whale		0

The proposed project will have the possibility of resulting in Level B harassment of pinnipeds and cetaceans and limited Level A harassment of cetaceans. Level B harassment is temporary in nature, and the impacts associated with the potential harassment resulting from this project will be temporary and will cease upon completion of construction. Level A takes are requested only for high-frequency cetaceans, Dall's porpoise and harbor porpoise, due to the large size of the Level A harassment zones and their potential to enter the zone undetected. Shutdown measures will be implemented if either species is observed in the zone to limit the noise exposure and reduce the chance of PTS. According to an analyses prepared for the Haines Lutak Dock IHA application, it was determined that for PTS to occur from drilling an animal would need to remain within approximately 971 feet (296 m) of drilling operations for a full 24-hour period (84 FR 65117). Because the Level A zone starts at 220 meters from pile installation and correspond with the shutdown zone, work will not occur for a full 24-hours, and shutdown will be implemented if a species is observed in the Level A zone the probability of PTS occurring is extremely low. Further, monitoring (Section 11 and Appendix B) is expected to reduce the potential for PTS or Level A harassment of Dall's porpoise and harbor porpoise and eliminate the potential for Level A harassment of the humpback whale, Steller sea lion, harbor seal, killer whale and minke whale.

Table 14 (Section 6) demonstrates that the number of animals that may be exposed to elevated noise levels resulting in harassment are small percentages of the stock. . As can be seen in Table 14, most of the take estimates of individual animals fall below this threshold with the exception of harbor seals and harbor porpoises. However, some of these takes are likely to be of the same induvial due to the conservative method of estimating the number of individuals that may be exposed. Further, this estimate applies to total take estimates and Level B harassment is not likely to result in serious injury or mortality for the reasons discussed above and as such all Level A takes that have the potential for PTS or injury are small percentages of the stock (Table 14). Potential takes at these levels are not expected to have any effect on populations, population recruitment or survival. Based on this analysis of potential effects of the Sentinel Island Access Float project on marine mammals, and taking into account mitigation measures (Section 11), only small numbers of marine mammals are likely to be taken relative to populations of the affected species/stocks with a negligible impact to the species/stocks.

[1] (Muto *et al.* 2019)

8 Anticipated Impact on Subsistence Uses

Alaska Native hunters in the Juneau vicinity do not traditionally harvest humpback whales and are not authorized to take humpback whales from the stock present in the action area (Muto *et al.* 2019). Steller sea lions have been traditionally hunted by Alaska Natives in Southeast Alaska for food and material products such as meat, skins, and whiskers (for art and regalia). Active hunting continues in the western Gulf of Alaska region of the wDPS range, but very few sea lions are harvested in Southeast Alaska in recent years (Wolfe *et al.* 2013, 83 FR 52394). Most sea lion harvests occur in winter months. In 2012, all nine of nine sea lions harvested in Southeast Alaska were male (Wolfe *et al.* 2013). Harbor seal, however, remain highly prized for rendering oil, fat, meat, and skins for cultural uses and are actively hunted in the Auke Bay vicinity (83 FR 52394).

Records on Steller sea lion total subsistence takes includes kills plus struck and lost animals. Subsistence reports do not attribute the animals to eastern or western stocks of Steller sea lion. Impacts of subsistence hunting on the endangered western stock can only be coarsely inferred by applying the estimated percent of wDPS animals in northern Southeast Alaska (1.4%) to harvest numbers described below, but this estimate should not be construed as a take of endangered Steller sea lions without applying appropriate demographic, DNA and other parameters to the calculus.

The ADF&G subsistence data for Southeast Alaska shows that from 1992 through 2008, plus 2012, from zero to 19 animals were taken by Alaska Native hunters per year (Wolfe *et al.* 2013). The total subsistence sea lion take in these reporting years was an estimated 104 animals, averaging 8 sea lion takes per year (Wolfe *et al.* 2013). Of the total sea lions taken, two were reported taken from the Juneau area: one in 1994 and one in 2006 (Wolfe *et al.* 2013).

Subsequent to the 2012 reporting year through 2017, an estimated 12 or fewer Steller sea lions have been taken annually in all of Southeast Alaska (personal communication with Lauren Sill, ADF&G, 83 FR 52394). Up to ten Steller sea lions are taken annually in the Sitka Sound vicinity for meat and hides, and an estimated one to three sea lions are taken in Southeast Alaska communities outside Sitka Sound (personal communication with Lauren Sill, ADF&G, 83 FR 52394). There are no reported subsistence takes of sea lion in the Juneau vicinity or in the project area since 2006 (personal communication with Lauren Sill, ADF&G, 83 FR 52394).

Harbor seals are hunted by Alaska Native subsistence hunters within the Auke Bay/Juneau area (83 FR 52394). The ADF&G, in partnership with the Alaska Native Harbor Seal Commission and hunters, compile information on subsistence seal harvest through household surveys. Based upon data for harvests in most hunting communities, hunters in Southeast Alaska took from 523 to 719 harbor seals annually in the years 1992-2008. In 2012 an estimated 595 harbor seals were taken for subsistence uses (Wolfe *et al.* 2012). Seals were harvested across the year, with peak harvests in March, May, and October. Lowest harvests were in December, January, and February. Construction will occur outside of peak harvest months, reducing the chance of impacting the availability of marine mammals for subsistence users.

Most recent reported data indicate that in 2012, an estimated 5 seals were struck and lost, and about 26 harbor seal were harvested for food (Wolfe *et al.* 2013). From 2013 through 2019, Juneau area harbor seal hunting has continued, with several cultural heritage programs teaching students how to harvest, cut and store seal meat. The most recent information available is from the 2012 Wolfe *et al.* and as such there is no information on take numbers from 2013-2019 (personal communication with Lauren Sill, ADF&G).

There are no known subsistence takes of Dall's porpoise, harbor porpoise or killer whale subsistence takes in Alaska. Subsistence takes of minke whales in Alaska is very rare, with only seven reported between 1930 and 1987. The last known take of a minke whale occurred in 1989, however it is likely that reports are incomplete. The average take of minke whales from 2012-2016 is zero whales.

8.1 Impact on Availability of Marine Mammals for Subsistence Uses

Juneau area subsistence hunters do not target humpback whales, and very rarely target Steller sea lions; however, local Native communities hunt harbor seal for meat, oil, blubber, and skins.

The proposed project is anticipated to have no long-term impact on Steller sea lion or harbor seal populations, or their habitat. Since there is very little sea lion hunting in the Juneau area, short term displacement of animals from the project area is anticipated to have no effect on abundance or availability of Steller sea lions to subsistence hunters. Further, due to the project timing, Steller sea lions are typically absent from the project area and it is possible none will be displaced and the effects to Steller sea lions have been minimized to the extent practicable.

Neither the local population nor any individual harbor seal are likely to be adversely impacted by the proposed action beyond noise-induced harassment or slight injury. Temporary displacement, and seals being more dispersed from haulout locations and or foraging areas in the action area, may increase harbor seal vulnerability to predators such as killer whales, potentially reducing the local seal population.

The Douglas Indian Association, Sealaska Heritage Institute, and the Central Council of the Tlingit and Haida Indian Tribes of Alaska (Central Council) were contacted during December of 2019 to provide a brief description of the project and inquire whether they would like to discuss the project or foresaw any impacts that would be likely from the Sentinel Island Access Float project. The Douglas Indian Association responded that they did not see any impacts that may affect their Tribal territory or wildlife (personal communication with Kamal Lindoff, Douglas Indian Association).

Chuck Smythe, with the Sealaska Heritage Institute, responded indicating that there is known harbor seal hunting in the area (Personal Communication with Chuck Smythe, Sealaska Heritage Institute). He indicated that the project will likely result in temporary disturbances, however believes that other locations in the area can absorb these temporary displacements without any significant impacts to the availability of harbor seals for subsistence uses (Personal Communication with Chuck Smythe, Sealaska Heritage Institute). He also commented on Steller sea lion pups at Benjamin Island in April and May, and recommended that the project schedule avoid these times. The construction window is outside of this time period and has been selected to minimize impacts to Steller sea lions to the extent practicable.

A confirmation was provided that the request for comments on the project impacts to subsistence uses was received and passed on to the Central Council's Office of the President, however no other comments have been received at the time of writing this application.

The proposed project will not result in the death or serious injury of any marine mammal. The project is likely to result only in short-term, temporary impacts to pinnipeds and cetaceans. The proposed project is not likely to adversely impact the availability of any marine mammal species or stocks that are commonly used for subsistence purposes.

9 Anticipated Impact on Habitat

The action area provides habitat for the marine mammal species listed in this application that supports foraging, refuge, or reproductive activities, including designated critical habitat for the Steller sea lion and proposed critical habitat for the humpback whale. Critical habitat is defined as "specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations for protection" and "specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation." Physical components of critical habitat will not be affected by the proposed action.

9.1 Vessel Interactions

Impacts to habitat include the potential for increased vessel traffic in the area, including within designated Steller sea lion critical habitat.

Sentinel Island is located within Favorite Channel/Lynn Canal in an area frequented by whale watch vessels, commercial and recreational fishing vessels, ferries, barges and other vessels (Section 2.5.1). The primary project purpose is to provide improved access for volunteers and contractors in efforts to perform historic preservation activities of the National Register listed Sentinel Island Lighthouse. The GCHS is also interested in offering day tours of the historic light house.

Currently, vessel landings at Sentinel Island are minimal. The lighthouse is rented out for overnight use, in which case most visitors will be dropped off on a rocky shore and picked up the following day due to the lack of a dock. The GCHS goes out to Sentinel Island approximately 12 times per year. These trips are often multiple days and personnel are typically dropped off by a charted vessel and then picked up a couple of days later. Recreational visitors also occasionally visit the island and sometimes are able to secure small skiffs near the island dependent on the tidal stage, however the number of these visits is unknown.

The anticipated increase in vessel traffic from this project is challenging to quantify and future growth may be driven by the growth of the visitor industry in the Juneau vicinity, however the number of tours possible is limited by the size of both the island and the proposed dock. Further, while GCHS desires to offer tours, they are also invested in the care and maintenance of the lighthouse and as such do not wish to overwhelm the island with visitors. Initially it is anticipated that (2) daily tours would be offered with a potential of up to (4) trips daily, with either multiple runs of the same vessel or independent vessels. The purpose of the tour is to visit the historical lighthouse, not wildlife viewing. Vessel traffic associated with the project would transit to and from the site only, however may briefly view wildlife encountered in transit. The vessel(s) origin may be located south of the project in Statter Harbor or north of the project near Aldersheim, however the actual location is unknown at the time of this writing and may change from year to year depending on moorage availability. No vessels have yet been dedicated to tours, however it is likely that 18 passenger vessels would be used initially. If tour demand warrants larger vessels, it is likely that vessels with a capacity of around 40 passengers would be utilized. The size of the float will generally limit operations as it can only fit one larger vessel at a time or possibly 2 small vessels. It is important to note that these are estimates only and actual number or tours and vessels is dependent on the future growth of the visitor industry. It is also important to note that there are no current regulations preventing whale watch companies, or other tour companies, from adding new vessels to their fleets regularly, which most companies in the area do on an annual basis as visitor numbers in the area continue to increase.

It is anticipated that any increase in vessel traffic in this area would be negligible in comparison to the overall vessel traffic in the area – which includes commercial whale watch vessels visiting the Benjamin Island Haulout to observe sea lions while looking for/watching humpback and killer whales in Favorite Channel/Lynn Canal/Saginaw Channel; commercial fishing vessels; charter fishing vessels; AMHS ferry vessels; and shipping barges.

9.2 Underwater Noise

One of the main effects on marine mammal habitat is elevated noise levels associated with pile installation. These elevated noise levels within marine mammal habitat could result in temporary disturbances to prey, in addition to behavioral responses such as the marine mammal leaving the area. Increased noise levels within marine mammal habitat will likely disaggregate schools of forage fish in the action area.

Driving piles generates intense underwater sound pressure waves that would have the potential to displace, injure, or kill fish. The extent of injury or harm to fish is difficult to quantify. Pile driving/drilling in other areas has not shown significant disruption to adult salmon movement or behavior and indicate that it is unlikely that large fish will suffer injury from in-water noise produced by activities like the pile driving/drilling activities planned for this project (Ruggerone *et al.* 2008). However, herring, juvenile salmon and other small fish may be more susceptible to adverse impacts from pile driving/drilling due to their smaller body size.

Noise from pile driving/drilling and other construction has been shown to have negative impacts on fish ranging from behavior alteration to mortality, depending on the sound intensity and characteristics of the fish present (Caltrans 2015). Impact hammers have the greatest potential to injure fish as after the first few strikes the startle response has been observed to wane and fish may remain within harms distance from the noise source (Limpinsel *et al.* 2017). On the other hand, fish have been shown to exhibit a consistent startle response to vibratory hammers without becoming habituated, even after numerous exposers (Limpinsel *et al.* 2017). Because vibratory hammers and drilling are the primary means of construction for this project the primary effects are anticipated to be prey dispersal.

While prey may disperse to nearby habitat, after activities cease each day, it is expected that forage fish will re-aggregate and become more available. This is because vibratory equipment will be the primary means of pile installation for the project. Due to the use of vibratory equipment as the primary means of pile installation, long term impacts on the availability of prey availability is not anticipated. Further, numerous past pile driving/drilling projects do not appear to have deterred marine mammals from using the project area and the continued use of the areas indicates prey species re-aggregate and become available for marine mammals once pile driving/drilling has ceased.

Because elevated noise levels are limited to the construction phase these are short term impacts and marine mammals are expected to resume regular use of the habitat once construction noise has ceased. Effects to marine mammal habitat from noise-induced dispersal or disaggregation of prey within their habitat, would be insignificant and discountable due to the temporary nature of the activity and prey availability and distribution is anticipated to return to normal after construction ceases.

9.3 Water Quality

Pile installation may result in minor, short-term adverse impacts to water quality within marine mammal habitat by causing an increase in turbidity by suspending sediment off of the sea floor. When sediment is suspended it often results in visible turbidity plumes that are expected to to be localized to a radius of apprximately 25 feet (7.6) around the pile (Everitt *et al.* 1992). This plume is anticipated to disipate quickly, within a few minutes to several hours, after pile installation operations are completed due to local current and tidal actions that would increase the rate of sediment dispersion.

10 Anticipated Effects of Habitat Impacts on Marine Mammals

10.1 Vessel Interactions

Close proximity to vessel presence has been observed to disrupt feeding aggregations of humpbacks, including separation of mothers and calves, as well as dispersal of the fish schools they were targeting (Krieger and Wing 1986). In addition to its acoustic impacts, vessel traffic also poses a direct threat to humpbacks through ship-strike injury and mortality (Muto *et al.* 2019). Vulnerability to ship-strike may be higher in areas where humpbacks rest, as they spend three times as much time at the surface when resting than when traveling fast. Vessel strikes are not a major source of mortality for other marine mammals in this application, with the exception of resident killer whales that may be in close proximity to fishing vessels and have been overserved following vessels to consume the processing waste (Muto *et al.* 2019).

Sea Grant research indicates that humpback whales may increase energetic expenditure when vessels are nearby based on observations of decreased time in-between breaths at the surface as the number of vessel (Pearson and Schueler 2019; Teerlink 2017). In the presence of vessels researchers also observed whales swimming at higher speeds and with higher reorientation rates. Teerlink (2017) measured concentrations of steroid hormones, including cortisol, from biopsy samples in whales in the Juneau area that area subjected to large amounts of vessel traffic and compared the results to whales in other areas with less vessel traffic. No evidence of increased stress response were found in whales in the Juneau area indicating humpback whales in the Juneau area are likely habituated to vessel traffic (Teerlink 2017). The research also conducted surveys of whale watch patrons and found that after taking part in a whale watch tour, the passengers were generally more supportive of regulations protecting whales.

Steller sea lions may be disturbed by approaching vessels when on terrestrial sites which can lead to stampedes as individuals flee towards the water. However, Steller sea lion responses to disturbance vary greatly ranging from no reaction to stampedes and the response is unpredictable (NMFS 1993). Disturbance at Steller sea lion haulouts and rookeries can also disrupt breeding or result in increased exposure to predation (Muto *et al.* 2019). Because the dock is located just outside of designated critical habitat vessel traffic approaching Sentinel Island is unlikely to disturb Steller sea lions at Benjamin Island as vessel traffic will be located on the fringes of, or outside of, the 3,000 feet (0.9 km) zone around Benjamin Island that is designated critical habitat.

The project has the potential to permanently increase the amount of vessel traffic within marine mammal habitat, however due to the substantial amount of existing vessel traffic in the area and marine mammals continued use of the habitat, the effects on marine mammals are expected to be minor and negligible.

10.2 Noise

Construction activities will likely have temporary impacts on marine mammal habitat through increases in underwater and airborne noise from pile driving/drilling. The primary reason that animals would leave habitats in the project area would be due to elevated noise levels. Project-related disturbances will be detectable at the nearest known Steller sea lion and harbor seal haulouts. No physical alterations will be made to designated Steller sea lion habitat and construction will be timed when the majority of Steller sea lions are known to vacate Benjamin Island in order to avoid and minimize disturbance. Marine mammals may be temporarily displaced to nearby habitat in the Lynn Canal/Favorite Channel area.

Marine mammals feed on prey that may be disturbed within the action area. In order to minimize effects on Steller sea lions construction will be timed when Steller sea lions are typically absent from the action area (mid-July – late-September) and thus disaggregation of prey is not anticipated to disturb Steller sea lions. Humpback whales regularly feed within Lynn Canal, Saginaw Channel and Favorite Channel. Feeding may be disrupted within the action area, however due to the close proximity to other known feeding grounds and short nature of

the project, it is anticipated effects on humpback whale feeding will be minimal. Other marine mammals, such as killer whales, may occasionally feed in the area only on an intermittent basis and are less likely to have feeding disrupted by the likely disaggregation of prey species in the area. However, all species may experience some energetic cost from short term dispersal of prey, resulting in short term expenditure of energy seeking other sources or waiting for prey to re-aggregate following noise effects.

10.3 Water Quality

The action area is located in close proximity to the mouths of the Eagle and Herbert rivers. Both of these rivers are glacially influenced and contribute a significant amount of sediment to waters within, and in the near vicinity of, the action area. This is common throughout southeast Alaska and as such fish and marine mammal species in the action area, and region, are regularly exposed to turbid waters from glacial sources.

Due to the expected limited radius of any turbidity plume (25 feet/7.6 m) and the shutdown measures (Section 11) it is unlikely that any species will be exposed to a turbidity plume. As discussed in Section 11, a 35 foot (10 m) shutdown zone will be implemented for all species and all in-water/over-water construction activities. However, while it is unlikely a marine mammal would be directly affected by elevated turbidity it is possible that elevated turbidity could impact prey distribution availability (see Section 10.2). Prey species are more likely to be impacted by the increased noise levels associated with pile installation, however turbidity plumes could linger for up to a few hours after pile installation ceases.

Due to the localized and temporary nature of increased turbidity, impacts on marine mammals would be short term and negligible.

11 Mitigation Measures to Protect Marine Mammals and Their Habitat

11.1 All Construction Activities

The proposed project avoids impacts as much as practicable, but impacts cannot be avoided entirely as this project is dependent on maritime access by nature. Because Lynn Canal/Favorite Channel is an active area, with high levels of vessel traffic (Section 2.5.1), particularly during summer months, there is an elevated level of ambient noise within the area compared to natural conditions. The mitigation measures and best management practices (BMP) that will be implemented are expected to reduce the project's impacts within the action area.

The following measures and BMPs will be incorporated by the applicant in order to minimize potential impacts:

- Improvement structures were designed to provide barrier-free migration and vertical movement for marine and estuarine fish. The improvements will be maintained in a manner that does not introduce any pollutants or debris into the water or cause a migration barrier for fish, such that prey continues to be available to marine mammals in the area.
- The improvement structures are designed to limit contaminant releases and will be maintained in a manner that manages pollutants and debris streams to avoid incidental introduction of deleterious materials into Favorite Channel/Lynn Canal.
- Fuels, lubricants, chemicals and other hazardous substances will be stored above the high tide line to prevent spills.
- Oil booms will be readily available for containment should any releases occur.
- To prevent spills or leakage of hazardous material during construction, standard spill-prevention measures will be implemented during construction. The Contractor will provide and maintain a spill clean-up kit on-site at all times.
- The contractor will monitor equipment and gear storage areas for drips or leaks regularly, including inspection of fuel hoses, oil drums, oil or fuel transfer valves and fittings, and fuel storage that occurs at the project site. Equipment will be maintained and stored properly to prevent spills.
- If contaminated or hazardous materials are encountered during construction, all work in the vicinity of the contaminated site will be stopped until a corrective action plan is devised and implemented to minimize impacts on surface waters and organisms in the project area.
- To avoid impacts to Steller sea lions and their critical habitat to the extent practicable, construction will occur between mid- July and late-September when Steller sea lions typically vacate Benjamin Island. The applicant understands that Steller sea lions do not always vacate the island or return on the authorization dates and will monitor sea lion presence at Benjamin Island to stay within authorized take numbers.
- Work has been timed to avoid impacts to spring spawning fish and out-migrating juvenile salmon to minimize impacts to marine mammal prey when fish are most susceptible to noise impacts (section 9.2) and to avoid impacts to overwintering herring when their energetic content is highest. By timing the project to occur when Steller sea lions are generally absent from the action area, it is likely that impacts to dense aggregations of prey are minimized.

11.2 Pile Installation

11.2.1 Monitoring and Shutdown

A minimum of 3 observers will monitor permitted pile driving/drilling activities in accordance with protocols reviewed and approved by NMFS. Shutdown will be implemented to minimize the chance for Level A harassment, and onset of PTS, in accordance with the Marine Mammal Monitoring Plan (MMMP) located Appendix B. Observation generally necessitates that daylight is sufficient for observers to visualize the entirety of the monitoring zones, so the daily construction window for pile driving will begin no sooner than 30 minutes after sunrise and will end 30 minutes before sunset to allow for pre- and post-activity monitoring respectively. In case of fog or reduced visibility, observers must be able to see the entirety of shutdown and monitoring zones before permitted activities can be initiated, however work may continue so long as shutdown zones are visible, in which case take will be extrapolated based on the amount of the monitoring zone visible. Where weather conditions limit the visibility of the monitoring zone after work has commenced, and where Level B zones are too large to be fully observed, takes will be extrapolated based on the percentage of the Level B harassment zone that is visible and the number/species observed. Percentages visible for each day will be determined by the monitoring team using maps and land features visible during monitoring efforts.

Monitoring and shutdown procedures are discussed in greater detail, and will be performed in accordance with the MMMP located in Appendix B.

11.2.2 Soft Start Procedures

To allow marine mammals to leave the area prior to exposure to maximum noise levels, soft start procedures shall be used prior to pile driving/drilling each day and when work ceases for more than 30 minutes.

For impact hammers, the soft start technique must initiate approximately three strikes at a reduced energy level, followed by a 30-second waiting period. This procedure would also be repeated two additional times before beginning in-water pile driving/drilling operations.

11.3 Vessel Interactions

In order to minimize impacts from vessel interactions with marine mammals, the crews aboard project vessels will follow NMFS's marine mammal viewing guidelines and regulations as practicable. (https://alaskafisheries.noaa.gov/protectedresources/mmv/guide.htm).

11.4 In-Water or Over-Water Construction Activities

During in-water or over-water construction activities, a shutdown zone of 33 feet (10 m) will be monitored to ensure that marine mammals are not endangered by physical interaction with construction equipment. If a marine mammal is observed in this zone shutdown will be implemented and vessel speeds reduced to the minimum level required to maintain steerage and safe working conditions

11.5 Compensatory Habitat Mitigation

GCHS has requested a permit for the proposed project under Section 404 of the Clean Water Act and Section 11 of the Rivers and Harbors Act from the USACE. To receive that permit, GCHS will be required to avoid, minimize, and mitigate impacts to intertidal habitat. For impacts that cannot be avoided or minimized, GCHS will coordinate compensatory mitigation with USACE.

12 Mitigation Measures to Protect Subsistence Uses

The project will take place in Juneau, which is located in waters south of the 60° North latitude demarcation. No activities will take place in or near a traditional Arctic subsistence hunting area. The project will not impact the availability of marine mammals for Arctic subsistence uses and no plan of cooperation is required for this project. Further, as addressed in Section 8, this project is not likely to impact the availability of any marine mammal for subsistence uses, particularly due to the project timing. The project timing will reduce impacts to dense prey aggregations and Steller sea lions by avoiding construction during times when Steller sea lions are typically present at Benjamin Island. This mitigation measure is discussed in Section 11. Considering the nature, timing and duration of the project it is unlikely that the project will the abundance or availability of marine mammals for subsistence uses.

Chuck Smythe, with the Sealaska Heritage Institute, requested that adequate public notice be given of the project to avoid any unfortunate incidents regarding hunters in the area (Personal Communication with Chuck Smythe, Sealaska Heritage Institute). In order to minimize the effects and protect subsistence uses the CGHS will contractually require the contractor to provide public notice 7 days in advance of the project, and again 2 days before construction commences in the local media. Additionally, information signage will be posted on the board at the Amalga Harbor boat launch 7 days prior to the commencement of construction.

13 Monitoring and Reporting Plans

13.1 Monitoring Plan

Monitoring measures for the potential impacts the project could have on marine mammals are discussed briefly in Section 11 and at length in the MMMP (Appendix B).

13.2 Reporting

The procedures for reporting are listed below and also in the MMMP (Appendix B).

13.2.1 Annual Report

A comprehensive annual marine mammal monitoring report documenting marine mammal observations will be submitted to NMFS at the end of the in-water work season. The draft comprehensive marine mammal monitoring report will be submitted to NMFS within 90 calendar days of the end of the in-water work period. The report will include marine mammal observations (pre-activity, during-activity, and post-activity) during pile driving/drilling days. A final comprehensive report will be prepared and submitted to NMFS within 30 calendar days following resolution of comments on the draft report from NMFS. The reports shall include at a minimum:

- General data:
    - Date and time of activity
    - Water conditions (e.g., sea-state)
    - Weather conditions (e.g., percent cover, percent glare, visibility)
- Pre-activity observational survey-specific data:
    - Date and time survey is initiated and terminated
    - Description of any observable marine mammals and their behavior in the immediate area during monitoring
    - Times when in-water construction is delayed due to presence of marine mammals within shutdown zones.
- During-activity observational survey-specific data:
    - Description of any observable marine mammal behavior within monitoring zones or in the immediate area surrounding the monitoring zones, including the following:
        - Distance from animal to sound source.
        - Reason why/why not shutdown implemented.
        - If a shutdown was implemented, behavioral reactions noted and if they occurred before or after implementation of the shutdown.
        - If a shutdown was implemented, the distance from animal to sound source at the time of the shutdown.
        - Behavioral reactions noted during soft starts and if they occurred before or after implementation of the soft start.
        - Distance to the animal from the sound source during soft start.
- Post-activity observational survey-specific data:
    - Results, which include the detections and behavioral reactions of marine mammals, the species and numbers observed, sighting rates and distances,
    - Refined exposure estimate based on the number of marine mammals observed. This may be reported as a rate of take (number of marine mammals per hour or per day), or using some other appropriate metric.

14 Coordinating Research to Reduce and Evaluate Incidental Take

The data recorded during marine mammal monitoring for the proposed project will be provided to NMFS in monitoring reports. These reports will provide information on the usage of the site by humpback whales, Steller sea lions, harbor seals, harbor porpoises, Dall's porpoises, killer whales and any other marine mammals as observed during the project. The monitoring data will inform NMFS and future permit applicants about the behavior and adaptability of pinnipeds and cetaceans for future projects of a similar nature.

15 Conclusion

For the reasons described in this document, GCHS has determined that the proposed project is likely to result in the Level B harassment of humpback whales, Steller sea lions, harbor seals, harbor porpoises, Dall's porpoises, killer whales and minke whales. The project may also result in a limited amount of Level A harassment of the harbor porpoise. This project has implemented impact minimization measures, including a Marine Mammal Monitoring Plan, to reduce the potential for unauthorized harassment.

While the harassment has the potential to result in minor behavioral effects or minor injury to any marine mammals present during project activities, based on the analysis presented in this document, these individual impacts will have a negligible effect on the stocks of marine mammals described in this document or on their habitats.

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Personal Communications

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Sadie Wright, Protected Species Biologist, NMFS Protected Resource Division
NMFS Protected Resources Division
Juneau, AK 99801
December 16, 2019 – telephone correspondence

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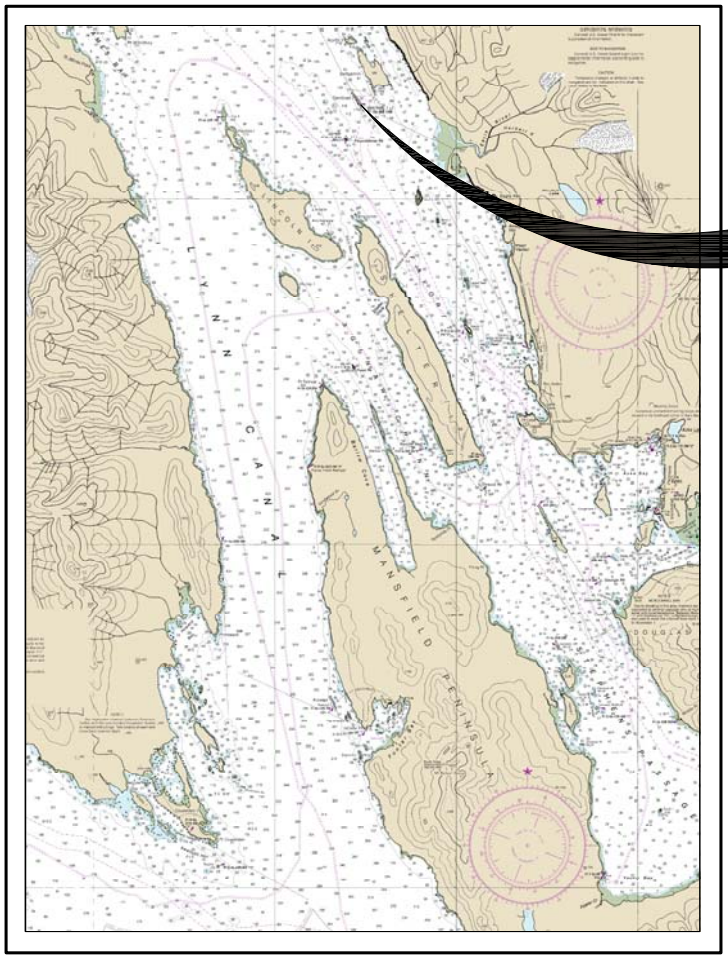
105 South Seward Street, Suite 201
Juneau, AK 99801
December 13-20, 2019 – email communicatio

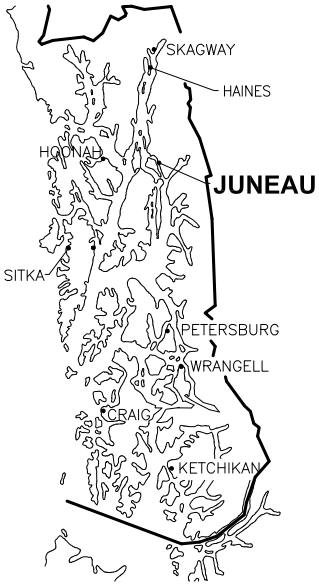
Appendix A. Project Permit Drawings

LOCATION MAP



THIS PROJECT

VICINITY MAP



SOUTHEAST ALASKA

TIDAL DATA	
EHW	23.2'
HTL	20.8'
MHW	15.4'
MLLW	0.0'

TO IMPROVE ACCESS BY INSTALLATION OF A PILE SUPPORTED MOORAGE FLOAT.

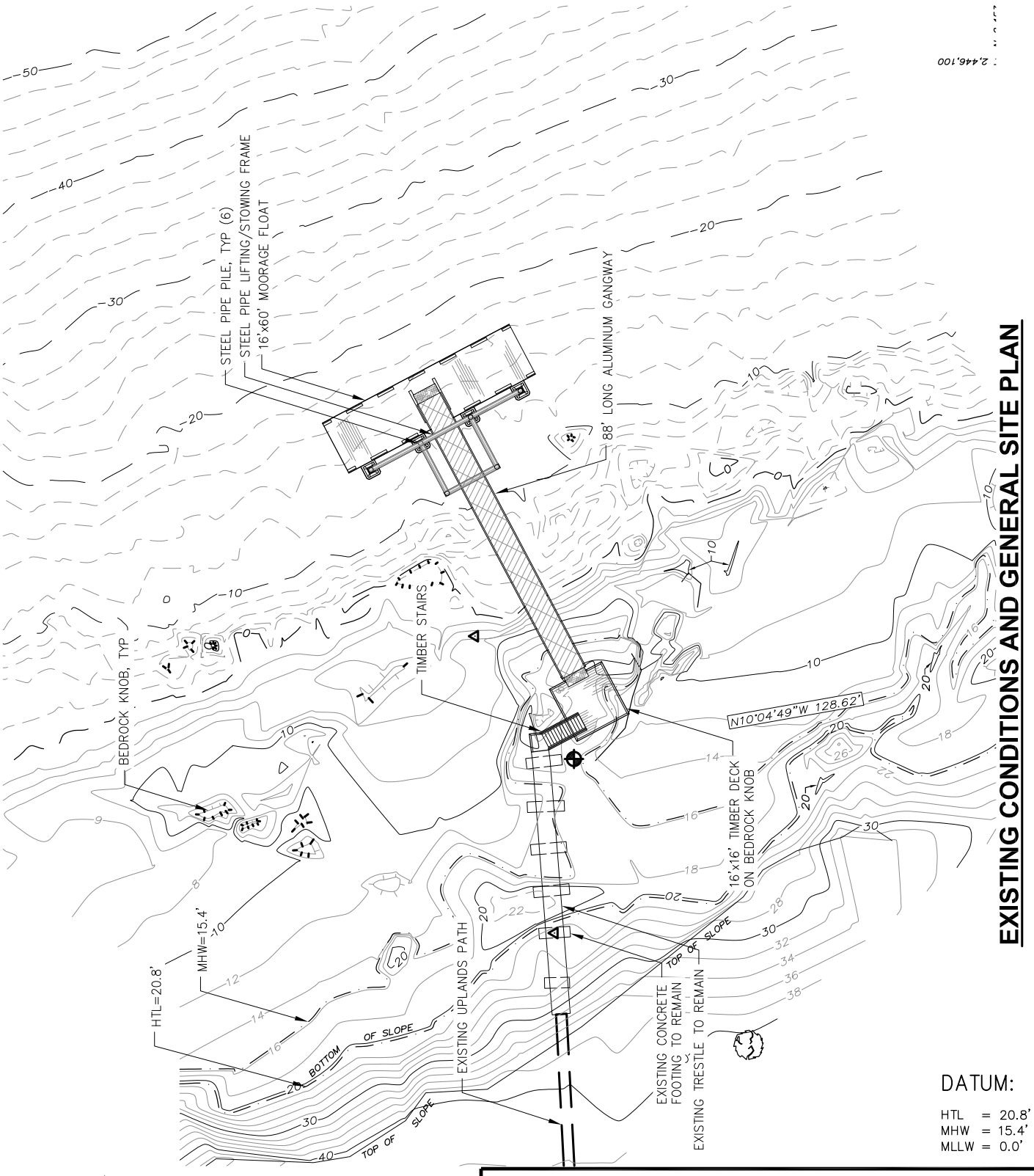
DATUM:
MLLW = 0.0 FT

HTL = 20.8'
MHW = 15.4'
MLLW = 0.0'

SENTINEL ISLAND MOORAGE FLOAT

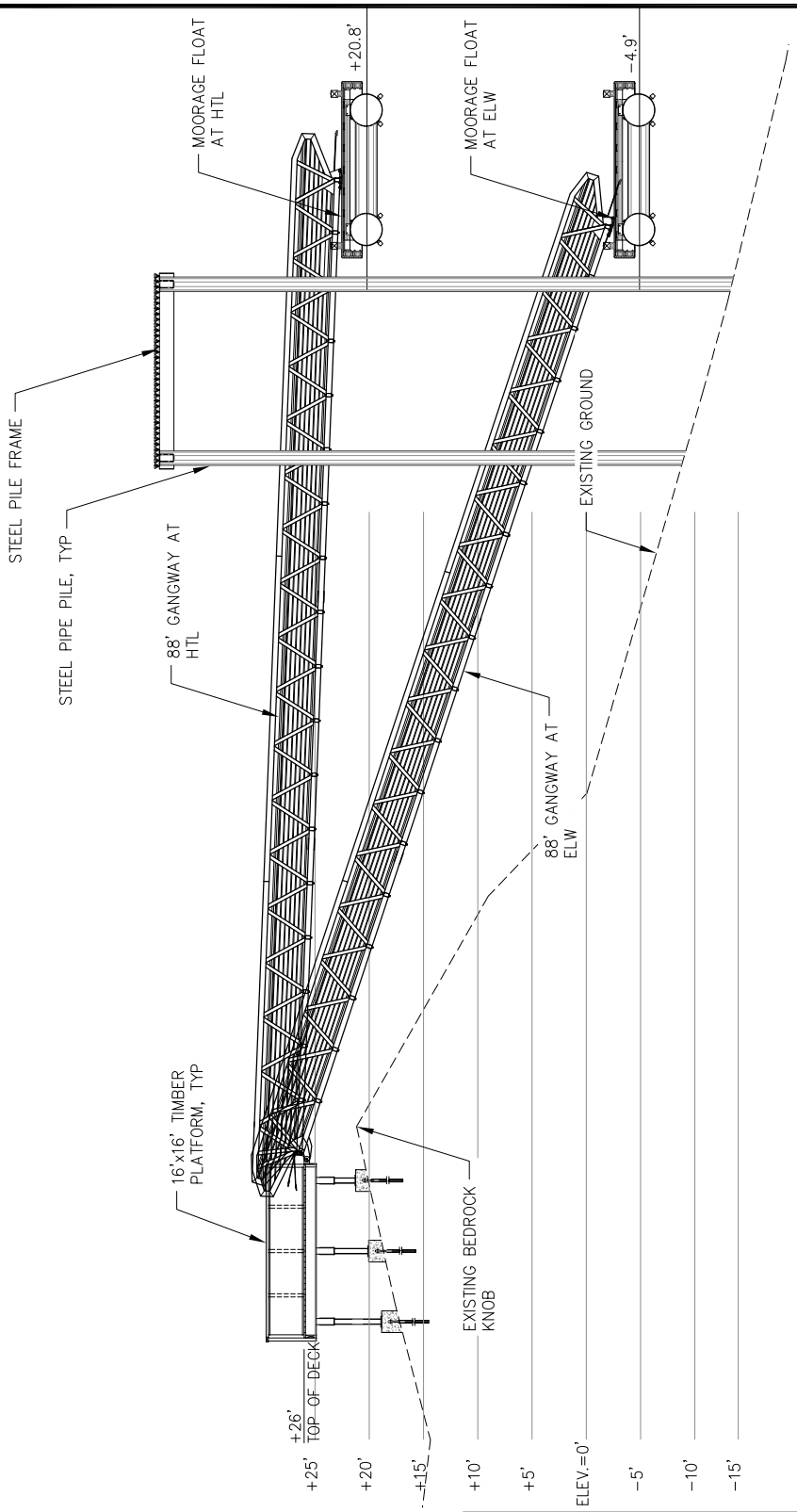
PND PROJECT NO. 182121.01

APPLICANT: GASTINEAU CHANNEL HISTORICAL SOCIETY
FILE NO.:
WATERWAY: FAVORITE CHANNEL
PROPOSED ACTIVITY: MOORAGE FLOAT
SEC. 25 & 30 **T.** 38S **R.** 63e & 64E **M** COPPER RIVER MERIDIAN
LAT.: 58°32.767'N **LONG.:** 134°55.268'W
DATE: NOVEMBER 2018



EXISTING CONDITIONS AND GENERAL SITE PLAN

APPLICANT: GASTINEAU CHANNEL HISTORICAL SOCIETY
FILE NO.:
WATERWAY: FAVORITE CHANNEL
PROPOSED ACTIVITY: MOORAGE FLOAT
SEC. 25 & 30 **T.** 38S **R.** 63E & 64E **M** COPPER RIVER MERIDIAN
LAT.: 58°32.767'N **LONG.:** 134°55.268'W
DATE: MARCH 2020



GANGWAY PROFILE

DATUM:

HTL = 20.8'
MHW = 15.4'
MLLW = 0.0'

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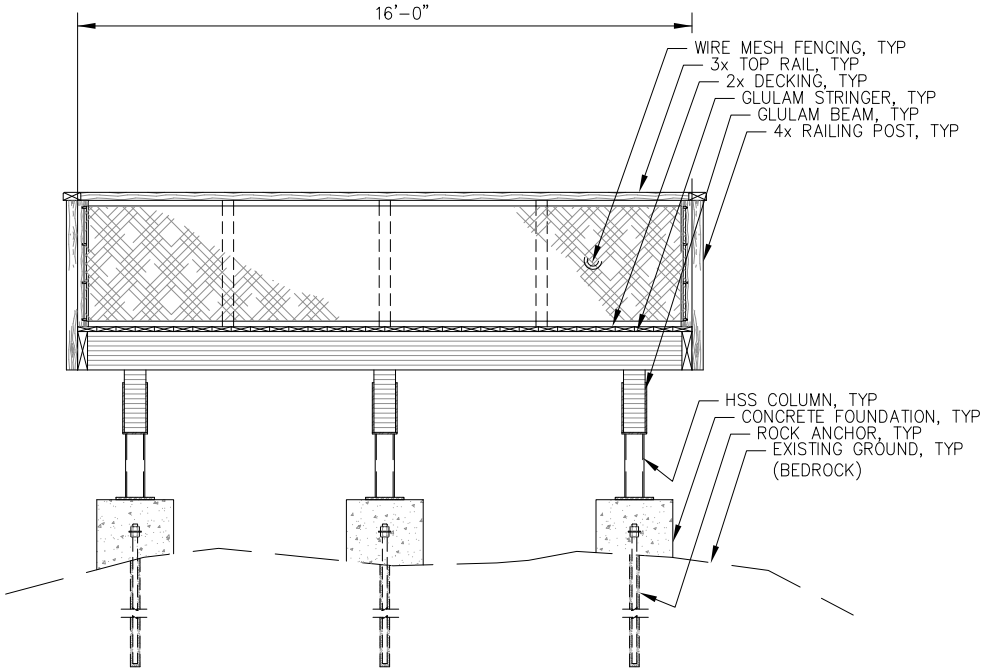
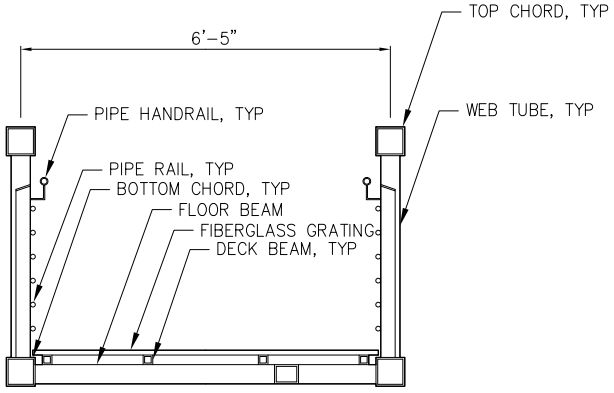
FILE NO.:
WATERWAY: FAVORITE CHANNEL
PROPOSED ACTIVITY: MOORAGE FLOAT
SEC. 25 & 30 **T.** 38S **R.** 63E & 64E **M** COPPER RIVER MERIDIAN
LAT.: 58°32.767'N **LONG.:** 134°55.268'W
DATE: MARCH 2020



A / - **TIMBER PLATFORM TYPICAL SECTION**

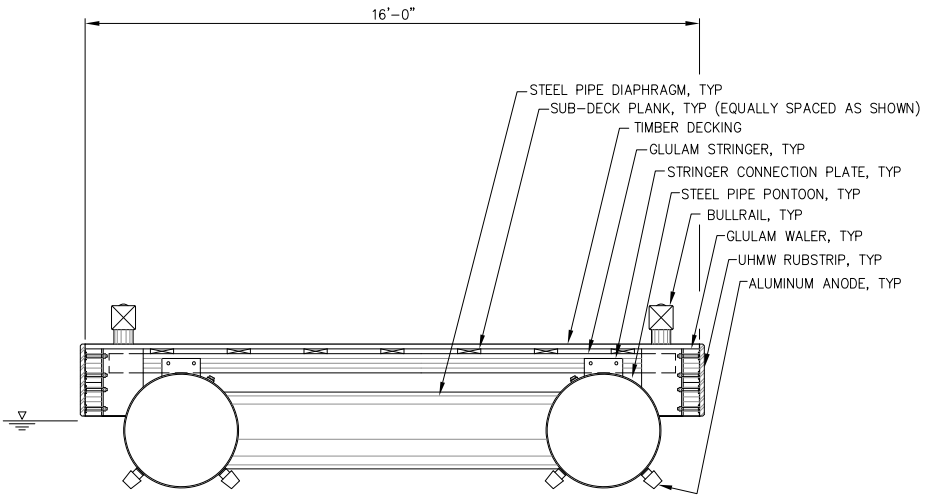


ALUMINUM GANGWAY - TYPICAL SECTION

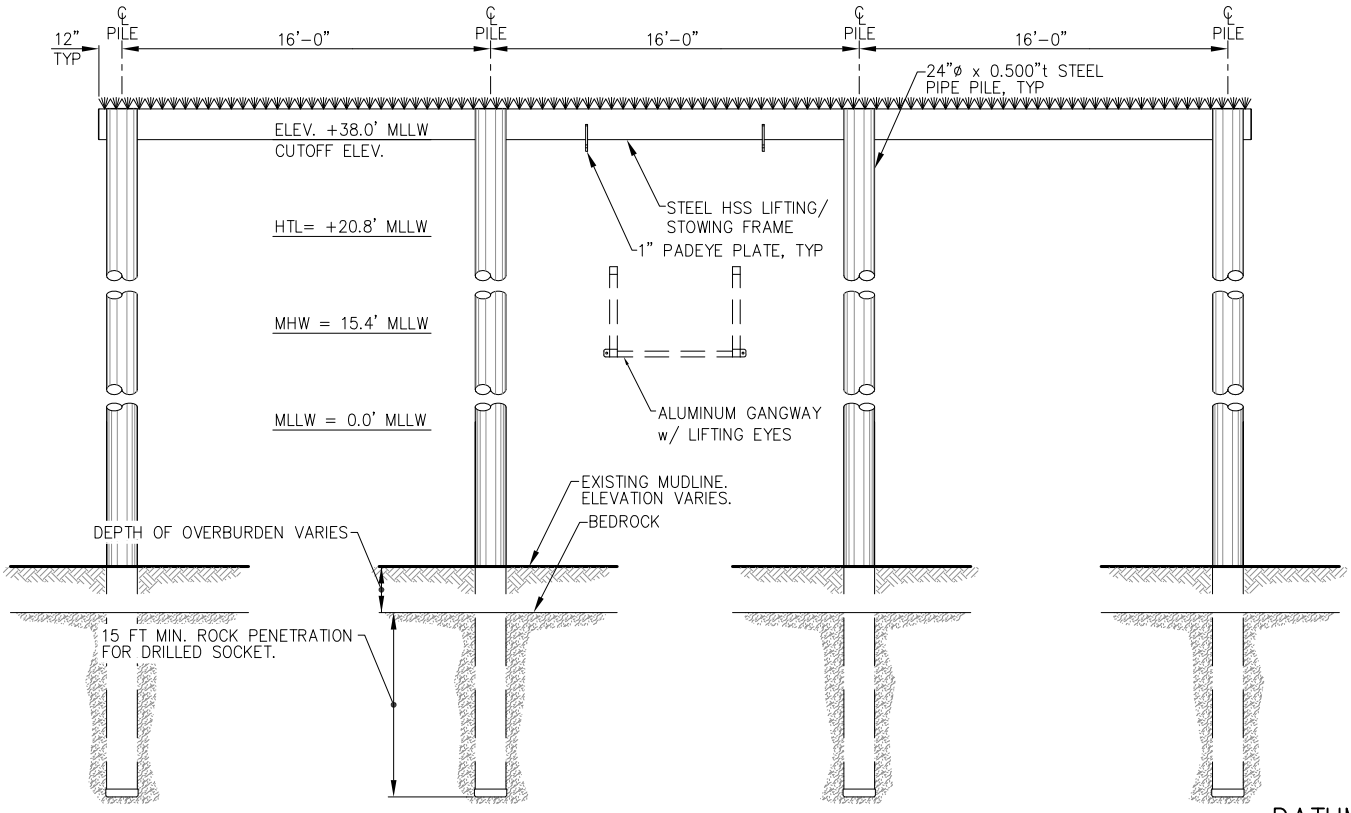
DATUM:

HTL = 20.8'
MHW = 15.4'
MLLW = 0.0'

APPLICANT: GASTINEAU CHANNEL HISTORICAL SOCIETY
FILE NO.:
WATERWAY: FAVORITE CHANNEL
PROPOSED ACTIVITY: MOORAGE FLOAT
SEC. 25 & 30 **T.** 38S **R.** 63E & 64E **M** COPPER RIVER MERIDIAN
LAT.: 58°32.767'N **LONG.:** 134°55.268'W
DATE: NOVEMBER 2018



A - MOORAGE FLOAT TYPICAL SECTION



SOCKETED MOORING PILE AND LIFTING FRAME

DATUM:

HTL = 20.8'
MHW = 15.4'
MLLW = 0.0'

APPLICANT: GASTINEAU CHANNEL HISTORICAL SOCIETY
FILE NO.:
WATERWAY: FAVORITE CHANNEL
PROPOSED ACTIVITY: MOORAGE FLOAT
SEC. 25 & 30 **T.** 38S **R.** 63E & 64E **M** COPPER RIVER MERIDIAN
LAT.: 58°32.767'N **LONG.:** 134°55.268'W
DATE: MARCH 2020

Appendix B. Marine Mammal Monitoring Plan

Marine Mammal Monitoring Plan
for the
Sentinel Island Moorage Float

Gastineau Channel Historical Society
Juneau, Alaska

Revised February 2020
(DRAFT Pending receipt of final permits)

Submitted to:

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

Prepared by:

PND Engineers, Inc.
9360 Glacier Highway, Suite 100
Juneau, Alaska 99801
(907) 586-2093

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ACRONYMS AND ABBREVIATIONS

- GCHS Gastineau Channel Historical Society
- ESA Endangered Species Act
- GPS global positioning system
- IHA Incidental Harassment Authorization
- MMMP Marine Mammal Monitoring Plan
- MMPA Marine Mammal Protection Act
- MSE Mechanically Stabilized Earth
- NMFS National Marine Fisheries Service
- NOAA National Oceanic and Atmospheric Administration
- PND PND Engineers, Inc.
- PTS permanent threshold shift
- SPL sound pressure level
- TTS temporary threshold shift

1 Introduction

The purpose of this Marine Mammal Monitoring Plan (MMMP) is to provide a protocol for monitoring affected species during the proposed construction of the Sentinel Island Access Float by the Gastineau Channel Historical Society (GCHS) at Sentinel Island in Juneau, Alaska. This plan was developed to support the Incidental Harassment Authorization (IHA) application under the Marine Mammal Protection Act, Section 101(a)(5)(D) permitting. The IHA application provides a detailed discussion on the calculations for the proposed action.

A marine mammal monitoring program will be implemented at the start of specified construction activities and will follow the protocols outlined in this MMMP. The primary goals of the monitoring program are:

- To monitor the proposed shutdown, harassment and monitoring zones, to estimate the number of marine mammals exposed to noise at, or exceeding established thresholds in the harassment zones, and to document animal responses;
- To minimize impacts to the marine mammal species present in the project area by implementing mitigation measures including monitoring, ensuring the shutdown zones are clear of marine mammals, soft start, and shutdown procedures; and
- To collect data on takes, occurrence and behavior of marine mammal species in the project area and any potential impacts from the project.

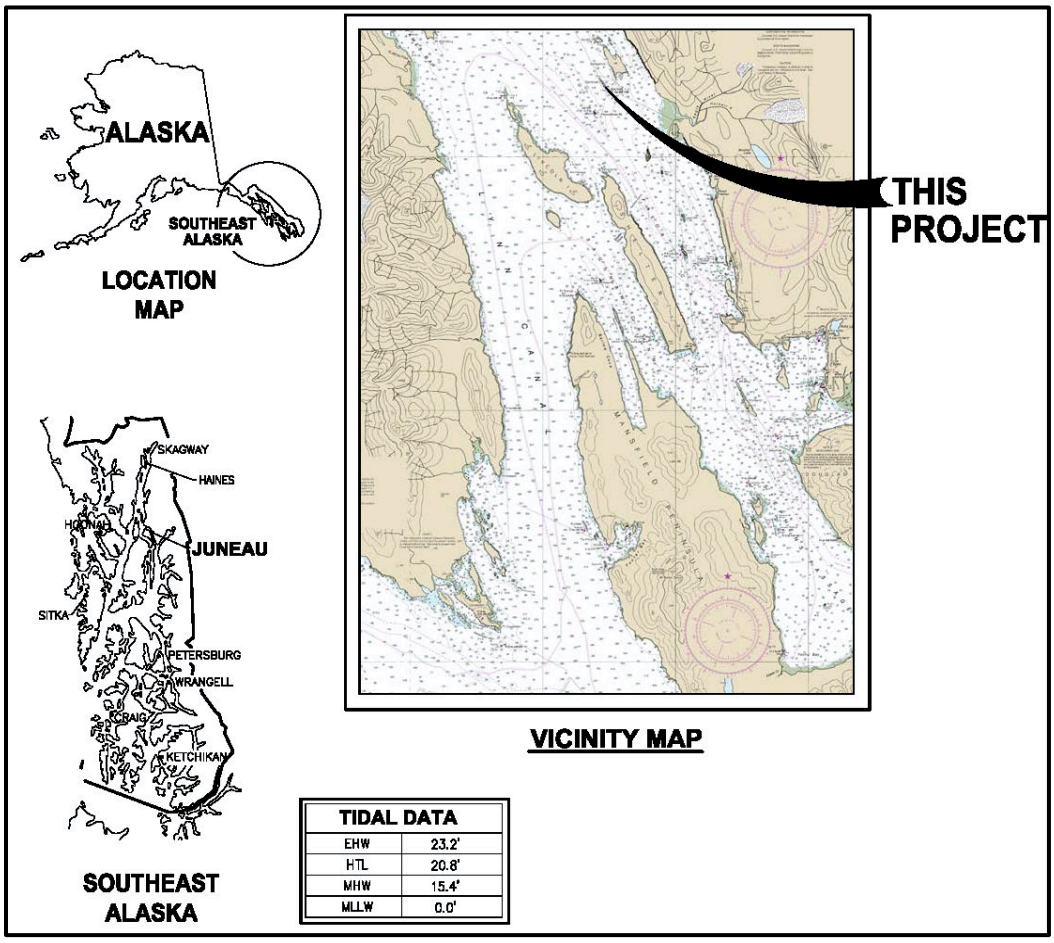

Figure 1. Vicinity Map

2 Project Description

The proposed project would install a pile supported marine float with a metal gangway spanning from the float to a timber platform on Sentinel Island. The facility would be seasonal use only due to wave and wind conditions which would likely damage the facility if left in place during winter months. The float would be removed in winter to be stored at another location. The piles have been designed to serve as a gangway storage frame during winter months and the gangway will be lifted and hung from the piles, out of the water during the winter months. The float is anticipated to be in place at Sentinel Island annually from April to October.

3 Species Covered Under IHA

Steller sea lions (*Eumetopias jubatus*), harbor seals (*Phoca vitulina*), humpback whales (*Megaptera novaeangliae)*, harbor porpoises (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), killer whales (*Orcinus orca*) and minke whales *(Balaenoptera acutorostra)* are covered under the Sentinel Island IHA request.

Work will shut down if any other marine mammal enters a harassment zone.

4 Methods

Under directives in the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA), this marine mammal monitoring and impacts minimization plan was tailored to the project to ensure appropriate documentation and compliance with applicable regulations. Monitoring will be conducted by NMFS approved marine mammal observers (hereafter, "observers"). Land-based observers will be located on-site before, during, and after in-water construction activity at sites appropriate for monitoring marine mammals within and approaching the Level A and Level B harassment zones.

Monitoring locations have been established on Sentinel Island at the project site, and on the mainland at the Mile 29 Eagle Beach pullout (Monitor 2) and the Shrine of St. Therese (Monitor 3) (Figure 2). Monitoring locations are limited due to private property, access restrictions and visibility. Monitoring sites were selected based on these same considerations. While visibility is greater in clear conditions, monitoring zones have been limited to 2.5 km due to the necessity to be able to see and identify marine mammals within the zone. Limited observations will be recorded beyond this monitoring zone as visibility allows, however will not be used to determine extrapolated take due to the need for consistency in methods. Monitoring will be restricted to the Level B harassment zone where these zones are smaller than the 2.5 km monitoring radius. Monitoring zones for each construction activity can be found in Table 1.

Where Level B zones are too large to be fully observed, takes will be extrapolated based on the percentage of the Level B harassment zone that is visible and the number/species observed. In instances of clear visibility takes will be estimated by the total area visible from all monitoring zones (Figure 2) compared to the overall Level B harassment zone. The total percentage of the action area that is visible is approximately 46.5% when taking into consideration the 0.4 km^2 overlap of Monitor 1 and Monitor 2. In instances of reduced visibility, after the commencement of construction (Section 4.6.1), percentages visible for each day will be determined by the monitoring team using maps and land features visible during monitoring efforts.

During observation periods, observers will continuously scan the area for marine mammals using binoculars and the naked eye. Observers will work shifts of a maximum of four consecutive hours followed by an observer rotation or a 1-hour break and will work no more than 12 hours in any 24-hour period. Observers will collect data including environmental conditions (e.g., sea state, precipitation, glare, etc.), marine mammal sightings (e.g., species, numbers, location, behavior, responses to construction activity, etc.), and construction activity at

the time of sighting, and number of marine mammal exposures (takes). Observers will conduct observations, meet training requirements, fill out data forms, and report findings in accordance with this MMMP.

Observers will implement mitigation measures including monitoring of the proposed shutdown and monitoring zones, ensuring shutdown zones are clear of marine mammals, and shutdown procedures. They will be in continuous contact with the construction personnel via two-way radio. A cellular phone with local service will be used as back-up communications and for safety purposes, however it is important to note that the project and monitoring sites are remote and cellular service may not be reliable.

An employee of the construction contractor will be identified as the pile driving/drilling supervisor for observers at the start of each construction day. Observers will communicate directly to the pile driving supervisor when a shutdown is deemed necessary due to marine mammals approaching the relevant shutdown zones construction activity.

4.1 Observer Qualifications

Monitoring will be conducted by qualified, trained observers. In order for observers to be considered qualified, the following requirements must be met:

- Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance;
- Physical capability of performing essential duties, including sitting or standing for periods of up to four hours, using binoculars or other field aid, and documenting observations;
- Experience and ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals and marine mammal behavior, including the ability to accurately identify marine mammals in Alaskan waters to species;
- Sufficient training, orientation or experience with the construction operation to provide for identification of concurrent activities and for personal safety during observations;
- Writing skills sufficient to prepare reports of observations; and
- Ability to communicate orally, by radio and in person, with project personnel to provide real-time information on marine mammals observed in the area and the appropriate mitigation response for the circumstances.

4.2 Data Collection

Observers will use a National Marine Fisheries Service (NMFS)-approved Observation Record (Appendix A) which will be completed by each observer for each survey day and location. Observation Records will be used by observers to record the following:

- Date and time that permitted construction activity begins or ends;
- Weather parameters (e.g. percent cloud cover, percent glare, visibility) and sea state (the Beaufort Wind Force Scale will be used to determine sea-state);
- Species, numbers, and, if possible, sex and age class of observed marine mammals;
- Construction activities occurring during each sighting;
- Marine mammal behavior patterns observed, including bearing and direction of travel;
- Specific focus should be paid to behavioral reactions just prior to, or during, soft-start and shutdown procedures;
- Location of marine mammal, distance from observer to the marine mammal, and distance from pile driving/drilling activities to marine mammals;

- Record of whether an observation required the implementation of mitigation measures, including shutdown procedures and the duration of each shutdown.

4.3 Equipment

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

- Appropriate Personal Protective Equipment;
- Portable radios and headsets for the observers to communicate with the pile driving/drilling supervisor and other observers;
- Cellular phone as backup for radio communication;
- Contact information for the other observers, pile driving/drilling supervisor, and NMFS point of contact;
- Daily tide tables for the project area;
- Watch or chronometer;
- Binoculars (quality 7 x 50 or better) or spotting scope with built-in rangefinder or reticles (rangefinder may be provided separately);
- Hand-held GPS unit, map and compass, or grid map to record locations of marine mammals;
- Copies of MMMP, IHA, and/or other relevant permit requirement specifications in sealed clear plastic cover;
- Notebook with pre-standardized monitoring Observation Record forms on waterproof paper; and

4.4 Shutdown and Monitoring Zones

GCHS has established shutdown, harassment and monitoring zones (Table 1) to delineate areas in which marine mammals may be exposed to injurious underwater sound levels due to in-water construction. Work which could cause noise levels to rise above non-permitted thresholds will shut down if marine mammals are approaching shutdown zones, where approaching is considered to be an animal moving in the direction of the shutdown zone within within 150 feet (50 m) of the applicable shutdown zone. Observers will also monitor and document activities in areas where animals could be subjected to noise levels at or above the permitted thresholds. The effective zones are summarized below and are discussed in detail in Section 5 of the IHA request.

Species with permitted Level B harassment under the IHA include Steller sea lions (*Eumetopias jubatus*), harbor seals (*Phoca vitulina*), humpback whales (*Megaptera novaeangliae*), harbor porpoises (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), killer whales (*Orcinus orca*) and minke whales *(Balaenoptera acutorostra)*. Take of any other marine mammal is not permitted under the IHA, nor is take by activities not authorized by the IHA.

Determination of harassment and shutdown zone radii was discussed fully in the IHA request. The effective Level A shutdown and harassment zones and non-authorized species shutdown radii are summarized in Table-1. The following shall apply to the monitoring and shutdown zones.

- During all in-water or over-water construction activities having the potential to affect marine mammals, a shutdown zone of 35 feet (10 meters) will be implemented to ensure that animals are not endangered by physical interaction with construction equipment or project vessels. These activities could include, but are not limited to, the positioning of the pile on the substrate via a crane ("stabbing" the pile) or the slinging of construction materials via crane. If a marine mammal is observed in this zone shutdown will be implemented and vessel speeds reduced to the minimum level required to maintain steerage and safe working conditions.
- Portions of the harassment zones will be monitored throughout the permitted in-water or over-water construction activity (i.e. monitoring zones). Monitoring zones and locations are depicted in Figure 2.

- If a permitted marine mammal enters the monitoring zone, an exposure will be recorded and animal behaviors documented. However, permitted construction activities would continue without cessation unless the animal approaches or enters the shutdown zone.
- If a marine mammal approaches or enters a shutdown zone, all permitted construction activities will be immediately halted until the marine mammal has left the shutdown zone.
- Take, in the form Level A harassment or B harassment, of marine mammals other than permitted species is not authorized and will be avoided by shutting down construction activities before individuals of these species enter the Level B harassment zone.

Table 1. Effective Shutdown and Monitoring Zones – Underwater Sources

Source	Shutdown Zone – Permitted Species					Level B Harassment Zone	Monitoring Zone
	Low-Frequency Cetaceans (Humpback Whale and Minke Whale)	Mid-Frequency Cetaceans (Killer Whale)	High-Frequency Cetaceans (Dall's and Harbor Porpoise)	Phocid Pinnipeds (Harbor Seal)	Otariid Pinnipeds (Steller and California Sea Lions)	All Species	All Species
Vibratory Installation /Drilling	265 ft (80 m)	35 ft (10 m)	395 ft (120 m)	165 ft (50 m)	35 ft (10 m)	7.5 miles (12.1 km)	1.6 miles (2.5 km)
Impact Pile Driving (Steel)	605 ft (185 m)	35 ft (10 m)	720 ft (220 m)	325 ft (100 m)	35 ft (10 m)	3,280 ft (1000 m)	3,280 ft (1000 m)

*Since many Level A harassment zones are smaller than the conservative 35-foot (10-meter) shutdown zone to prevent physical injury, the conservative shutdown zone will be implemented for all in-water activities.

4.5 Observer Monitoring Locations

In order to observe the shutdown and monitoring zones effectively, observers will be positioned at the best practicable vantage points, taking into consideration security, safety, access, and space limitations. A minimum of 3 observers will be stationed at locations that provide adequate visual coverage for shutdown and monitoring zones during pile driving and drilling activities. However, the Level B zones are generally too large to be fully observed, even with (3) land based observers and thus takes will be estimated by extrapolation based on the percentage of the Level B harassment zone visible. Observation locations and monitoring zones are depicted in Figure 2.

Monitoring zone identification may be based on fixed points and structure-defined areas incorporating the zone radii or greater area, rather than exact measurements. Marine mammal researchers and monitoring personnel typically use spotting scopes and binoculars to enhance visibility and reticle binoculars and laser range finders to gauge distance of animals from viewing stations. However, the project area provides challenges for these technologies. Reticle binoculars require an open-water backdrop (open horizon) to determine the angle for calculating distance to an object, and the observer must always know height above the subject viewed to make an accurate distance estimate. The recommended observation stations for this project are high points that provide a greater field-of-view of the project area, but complicate the geometry required for estimating distance to moving animals. Limiting factors such as structures, moving boats, or fog can interfere with spotting scope

or laser rangefinder distance measurements. For these reasons, we propose using monitoring zones defined by structures (such as ramps, docks, land features, and pilings) of precisely known geographic locations that approximately correspond to the calculated perimeters from circular project site monitoring zones. This practical adaptation will provide for much more precise counting of animals in a particular section of Favorite Channel/Lynn Canal without introducing ambiguous estimates of distance from construction equipment.

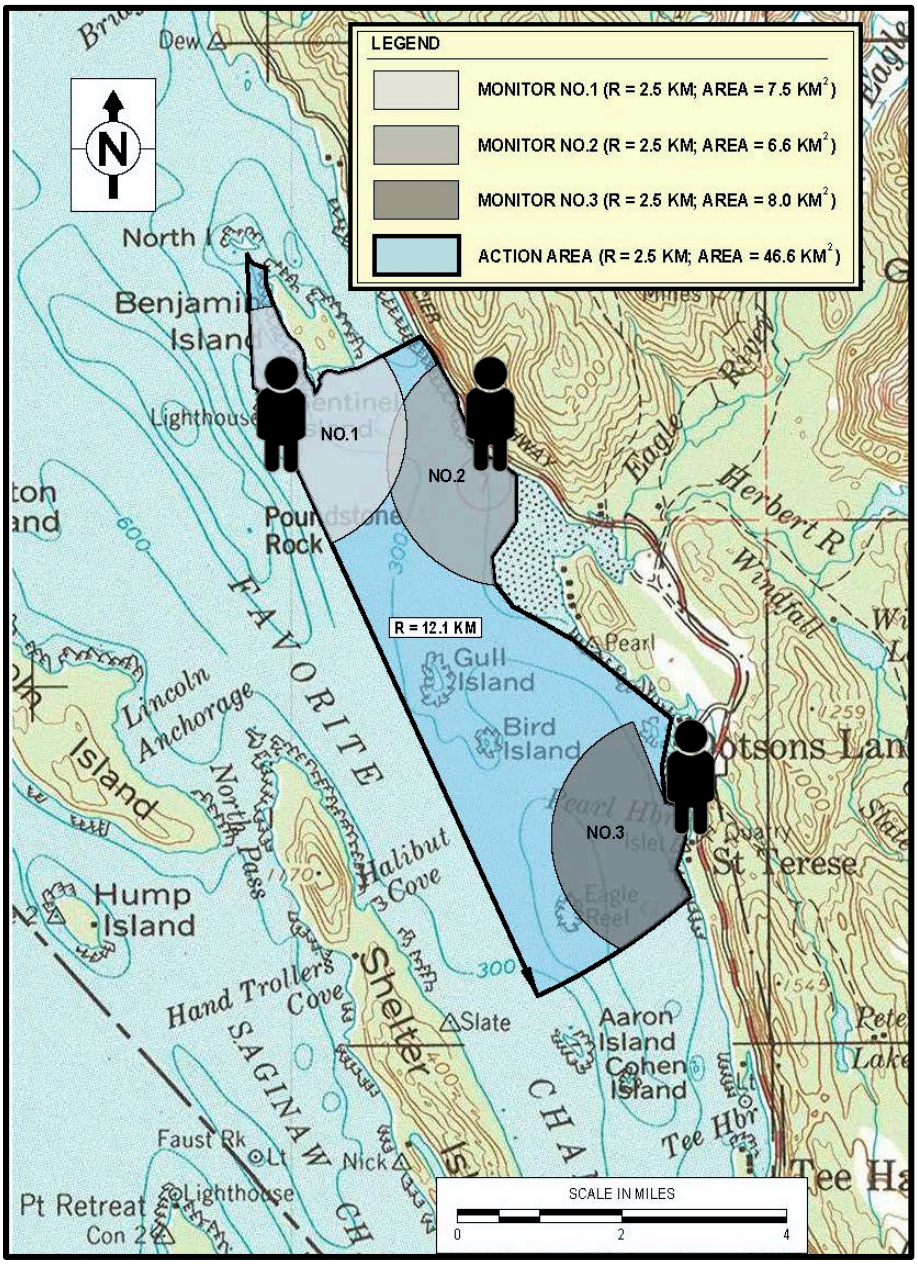

Figure 2. Observer Locations[1]

[1] Map from: USGS AK Topo Series; Juneau, Alaska-Canada (1:250,000)

4.6 Monitoring Techniques

GCHS will collect sighting data and behaviors of marine mammal species that are observed in the shutdown and monitoring zones during construction. All observers will be qualified and trained in marine mammal identification and behaviors, as described in Section 4.1. NMFS requires that the observers have no other construction-related tasks while conducting monitoring.

Monitoring of shutdown and observation zones will take place from 30 minutes prior to initiation through 30 minutes post-completion of all permitted activities.

Observation generally necessitates that daylight is sufficient for observers to visualize the entirety of the monitoring zones, so observations will commence and complete during daylight hours.

4.6.1 Pre-Activity Monitoring

The following monitoring methodology will be implemented prior to commencing permitted activities:

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

4.6.2 Soft Start Procedures

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

- For impact hammers, the soft start technique must initiate approximately three strikes at a reduced energy level, followed by a 30-second waiting period. This procedure would also be repeated two additional times before beginning in-water pile driving operations.
- If work ceases for more than 30 minutes, soft start procedures must recommence prior to performing additional work.

4.6.3 During-Activity Monitoring

The following monitoring methodology will be implemented during permitted activities:

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

4.6.4 Inclement weather

During inclement weather or periods of limited visibility, work that has begun with fully cleared monitoring and shutdown zones may continue. In those cases, an assumed rate of observation similar to the daily average rate of observation will be used to estimate the number of sightings to be reported during those periods so long as all shutdown zones (Table 1) are fully visible. Shutdown will be implemented in the event shutdown zones are no longer visible. This method will only be used if the full observation zone was visible during the start of work and no shutdowns greater than 30 minutes have occurred.

4.6.5 Shutdown

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

- The observers shall immediately radio or call[2] to alert the pile driving/drilling supervisor.
- All permitted activities will be immediately halted.
- In the event of a shutdown of pile driving/drilling operations, permitted activities may resume only when:
  - The animal(s) within or approaching the shutdown zone has been visually confirmed beyond or heading away from the shutdown zone, or 15 minutes (for pinnipeds) or 30 minutes (for cetaceans) have passed without re-detection of the animal;
  - Observers will then radio or call the pile driving/drilling supervisor that activities can re-commence.

4.6.6 Breaks in Work

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

If permitted activities cease for more than 30 minutes and monitoring has not continued, pre-activity monitoring and soft start procedures must recommence. This includes breaks due to scheduled or unforeseen construction practices or breaks due to permit-required shutdown. Following 15 minutes (for pinnipeds) or 30 minutes (for cetaceans) of monitoring, work can begin according to the pre-activity monitoring protocols. Work cannot begin if an animal is within the shutdown zone or if visibility is not clear throughout the shutdown and monitoring zones.

4.6.7 Post-Activity Monitoring

Monitoring of the shutdown and monitoring zones will continue for 30 minutes following completion of pile driving/drilling activities. A post-monitoring period is not required for other in-water construction. These surveys will record observations, focusing on observing and reporting unusual or abnormal behavior of marine mammals. Observation Record forms will be used to document observed behavior.

[2] Cellular service is limited at monitoring locations and it should be noted that this may not be a reliable form of communication, as such monitoring team should plan on relying on radio as the primary method of communication.

5 Reporting

5.1 Injured or Dead Marine Mammal

If GCHS finds an injured, sick, or dead marine mammal, a representative will notify NMFS and provide the species or description of the animal(s), condition of the animal or carcass, location, date and time of first discovery, observed behaviors (if alive), and photograph or video (if available).

- If the marine mammal's condition is a direct result of the project, notification will be made and work will stop until NMFS is able to review the circumstances of the prohibited take.
- If the lead observer determines that the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, scavenger damage), GCHS shall report the incident within 24 hours of the discovery. Construction activities may continue while NMFS reviews the circumstances of the incident and makes a final determination on the cause of the reported injury or death.
- If cause of death is unclear,GCHS shall immediately report the incident. Construction activities may continue while NMFS reviews the circumstances of the incident and makes a final determination on the cause of the reported injury or death. NMFS will work with GCHS to determine whether additional mitigation measures or modifications to the activities are appropriate.

Care should be taken in handling dead specimens, if encountered, to preserve biological materials in the best possible state for later analysis of cause of death. In preservation of biological materials from a dead animal, the finder (i.e. observer) has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed.

Reports will be made to the Office of Protected Resources and the Alaska Regional Stranding Coordinator.

5.2 Annual Report

A comprehensive annual marine mammal monitoring report documenting marine mammal observations will be submitted to NMFS at the end of the in-water work season. The draft comprehensive marine mammal monitoring report will be submitted to NMFS within 90 calendar days of the end of the in-water work period for each phase; or 60 days prior to the requested date of issuance of any future IHA's for projects at the same location, whichever comes first. The report will include marine mammal observations (pre-activity, during-activity, and post-activity) during permitted activities. All observer datasheets and/or raw sighting data will be submitted with the final report. A final comprehensive report will be prepared and submitted to NMFS within 30 calendar days following resolution of comments on the draft report from NMFS.

At a minimum the reports shall include:

- General data:
  - Date and time of activity
  - Water conditions (e.g., sea-state)
  - Weather conditions (e.g., percent cover, percent glare, visibility)
- Specific pile driving/drilling data:
  - Description of the pile installation being conducted (pile locations, pile size and type), and times (onset and completion) when pile driving/drilling occurs.
  - The construction contractor and/or marine mammal monitoring staff will coordinate to ensure that vibratory/drilling installation times and impact hammer strike counts are accurately recorded. The duration of soft start procedures should be noted as separate from the full power duration.

- Description of in-water construction activity not involving pile driving/drilling (location, type of activity, onset and completion times)

- Pre-activity observational survey-specific data:
  - Date and time survey is initiated and terminated
  - Description of any observable marine mammals and their behavior in the immediate area during monitoring
  - Times when in-water construction is delayed due to presence of marine mammals within shutdown zones.

- During-activity observational survey-specific data:
  - Description of any observable marine mammal behavior within monitoring zones or in the immediate area surrounding the monitoring zones, including the following:
    - Distance from animal to pile driving/drilling sound source.
    - Reason why/why not shutdown implemented.
    - If a shutdown was implemented, behavioral reactions noted and if they occurred before or after implementation of the shutdown.
    - If a shutdown was implemented, the distance from animal to sound source at the time of the shutdown.
    - Behavioral reactions noted during soft starts and if they occurred before or after implementation of the soft start.
    - Distance to the animal from the sound source during soft start.

- Post-activity observational survey-specific data:
  - Results, which include the detections and behavioral reactions of marine mammals, the species and numbers observed, sighting rates and distances,
  - Refined exposure estimate based on the number of marine mammals observed. This may be reported as a rate of take (number of marine mammals per hour or per day), or using some other appropriate metric.

Appendix A. Marine Mammal Observation Record

MARINE MAMMAL OBSERVATION RECORD

Project Name: Statter Harbor Improvements

Monitoring Location: ____________

Date: ____________

Time Effort Initiated: ____________

Time Effort Completed: ____________

Page ___ of ______

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

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

Marine Mammal Observation Record – Sighting Codes

Behavior Codes

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

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

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

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

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

Event

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

Sighting Cues

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

Marine Mammal Species

Code	Marine Mammal Species
HSEA	Harbor Seal
STSL	Steller Sea Lion
HPBK	Humpback Whale
OTT	Sea Otter
STEID	Steller's Eider
OTHR	Other

Construction Type

Code	Activity Type
V	Vibratory Pile Driving
D	Drilling
I	Impact Pile Driving
DP	Dead pull
ST	Stabbing
DR	Drilling
OWC	Over-Water Construction
NOWC	No Over-Water Construction
NONE	No Construction

Mitigation Codes

Code	Activity Type
SS	Soft Start
BC	Bubble Curtain
DE	Delay onset of In-Water Work
SD	Shut down In-Water Work

Visibility

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

Weather Conditions

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

Wave Height

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