Request for an Incidental Harassment Authorization
Turnagain Marine Construction
Whittier Head of the Bay Cruise Ship Dock

Passage Canal, Whittier, Alaska

February 2024

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ACRONYMS AND ABBREVIATIONS

4MP	Marine Mammal Monitoring and Mitigation Plan
ADF&G	Alaska Department of Fish and Game
ANSI	American National Standard Institute
AMHS	Alaska Marine Highway System
ARRC	Alaska Railroad Corporation
AWC	Anadromous Waters Catalog
CY	cubic yard
dB	decibel
DOT&PF	Alaska Department of Transportation and Public Facilities
DPS	Distinct Population Segment
DTH	down-the-hole
EFH	essential fish habitat
ESA	Endangered Species Act
Hz	Hertz
IHA	Incidental Harassment Authorization
kHz	kilohertz
LOA	Letter of Authorization
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PSO	protected species observer
PTS	permanent threshold shift
RMS	root mean square
SEL	sound exposure level
SPL	sound pressure level
TMC	Turnagain Marine Construction
µPa	micro pascal
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

1 DESCRIPTION OF SPECIFIED ACTIVITY

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

1.1 OVERVIEW

Turnagain Marine Construction (TMC) is requesting issuance of a second incidental harassment authorization (IHA) to continue construction that was authorized under an IHA issued by the U.S. Fish and Wildlife Service (USFWS) that is effective from July 18, 2023, to July 19, 2024 (22-IHA-05). The project began in May 2023 and construction is ongoing. It is anticipated that the project will not be completed by the IHA expiration date. The original IHA authorized TMC to take, by non-lethal Level A and Level B harassment, small numbers of northern sea otters (*Enhydra lutris kenyoni*) during pile driving and marine construction activities.

Under contract with Huna Totem Corporation, TMC is constructing a cruise ship berth and associated facilities on the western shore of Passage Canal, approximately 1.2 kilometers (km) northwest of downtown Whittier, Alaska.

The completed cruise ship berth will consist of a 500-foot by 70-foot floating dock structure supported by 2 float restraints on either end and 2 mooring dolphins in marine waters that support several marine mammal species. Pile driving may result in auditory injury (Level A harassment) and behavioral harassment (Level B harassment) of select marine mammal species. Pile installation activities are expected to occur for a total of approximately 70 hours over 30 days (not necessarily consecutive days).

The Marine Mammal Protection Act of 1972 (MMPA) prohibits the taking of marine mammals; to take 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 on marine mammals and would not adversely affect subsistence use of these animals.

TMC is requesting an IHA for Level A and Level B take of northern sea otters (*Enhydra lutris kenyoni*) that may occur in the vicinity of the project area in Passage Canal.

The items required for this application are included in the following Sections 1 through 14.

1.2 DETAILED DESCRIPTION OF SPECIFIC ACTIVITIES

1.2.1 Location

The Whittier Head of the Bay Development Project is located within the City of Whittier (City) in Southcentral Alaska; Township 8N, Range 4E, Sections 14, 15, and 22, Seward Meridian; USGS Quadrangle Seward D-5 SW; latitude 60.784° and longitude -148.716° (Figure 1 and Figure 2; Sheet 1).

Figure 1. Whittier Head of the Bay Cruise Ship Dock Project Location and Vicinity Map

Figure 2. Whittier Head of the Bay Cruise Ship Dock Project Location

1.2.2 Purpose and Need

Whittier, the "Gateway to Western Prince William Sound," is a regional maritime center for commercial, recreational and subsistence fishing, shipping and small boat access, cruise lines, the Alaska Marine Highway System (AMHS) and the Alaska Railroad Corporation (ARRC). Located within the Valdez-Cordova Census Area, Whittier supports a full-time resident population of about 270 people on a small area of land at the head of Passage Canal (2020 census data; Alaska Department of Labor and Workforce Development 2022).

Cruise ships have been using Whittier as a port of call for years. Since the Anton Anderson Memorial Tunnel was opened to private vehicle traffic in 2000, larger cruise ship lines have been adding Whittier as a destination, and ships stop two to three times per week in the summer months (May to September). Whittier Harbor is also a home port for day-cruise, charter, commercial fishing, and recreational vessels, as well as AMHS ferry operations (Alaska Department of Transportation and Public Facilities [DOT&PF] 2022).

The purpose of the project is to construct a new cruise ship berthing facility to alleviate pressure on the existing cruise ship dock. The existing cruise ship berth is located between the two harbors, and small vessels compete with larger ferry boats and cruise ships for the same general docking area on the south shore of Passage Canal. After a downturn in 2020 and 2021 caused by the COVID-19 pandemic, there are more cruise ships scheduled to visit Whittier in 2022 and 2023 (45 and 46 ships scheduled, respectively) than visited in 2019 (37; Cruise Line Agencies of Alaska 2018, 2022, and 2022a). Offering a second cruise ship berth on the west shore of Passage Canal, away from the city center, would increase safety of boat operations and lessen the burden on south shore facilities.

Additionally, the cruise ship berth would support economic growth and development in a town that depends on seasonal tourism. The City's 2020 Comprehensive Plan outlines community goals, objectives, and recommendations for implementation over the next five years. Focus Area 1: Tourism highlights various means of promoting tourism in the community to keep visitors returning and to attract more visitors. The Head of the Bay project is specifically mentioned as *Focus Area 4*; with the goal in mind to "pursue fiscally sustainable development opportunities...to create a Head of the Bay area that meets the needs of residents, businesses, and visitors" (City of Whittier 2020). The City supports industry development via implementation of this project and other associated projects at the head of Passage Canal such as a recreational boat launch, parking, camping, trails, and Shakespeare Creek restoration to spur economic growth and potential future business development in Whittier.

1.2.3 Anticipated Changes in Vessel Traffic

The action area experiences moderate levels of marine vessel traffic year-round with the highest volumes occurring April through October. Marine vessels that use the action area include cruise ships, passenger ferries, whale watching tour boats, charter and commercial fishing vessels, barges, freight vessels, recreational vessels, and kayaks (City of Whittier 2020).

Freight barges, cruise ships, and ferries are the largest vessels that routinely transit the action area. ARRC began freight operations out of Whittier's deep water port in 1964; approximately 25 percent of ARRC's freight cargo for Southcentral Alaska comes through Whittier. Alaska Marine Lines operates a weekly barge from Seattle to Whittier year-round (Alaska Marine Lines

2022). Cruise ships stop in Whittier approximately two to three times per week, May through September (Cruise Line Agencies of Alaska 2022 and 2022a). AMHS ferries make stops in Whittier five to eight times per week from March through September (DOT&PF 2022).

Even with the proposed expansion of the facility, cruise ships will maintain designated routes at the standard speed for these vessels (18 to 20 knots) (Royal Caribbean 2022). A small increase in vessel traffic is expected as a direct result of the proposed project of approximately 1 to 2 cruise ships per week.

1.2.4 Proposed Action

The Whittier Head of the Bay Cruise Ship Dock Project includes the following components (Figure 3; Appendix A: Sheets 2 and 3).

Completed components (to support the cruise ship berth):

- 52 permanent piles installed
- Likely to complete 5 more by 3/31

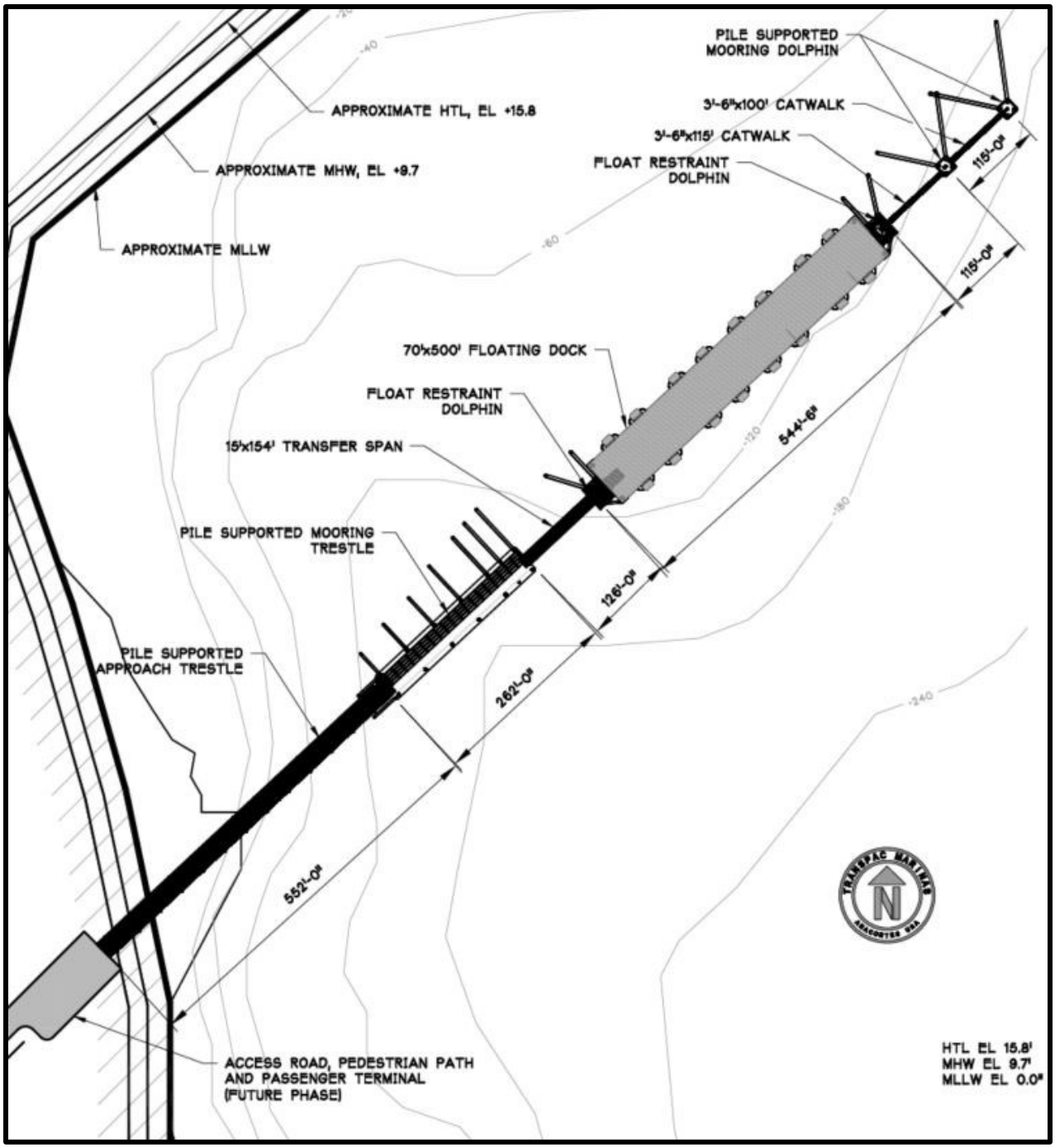
Remaining components:

- Eight 48-inch permanent piles to support two mooring dolphins
- Seven 36-inch batter pile two support the mooring trestle
- Fifteen 36-inch temporary piles

Additional project components include:

- Dock components such as bull rail, fenders, mooring cleat, pre-cast concrete dock surface, and mast lights (note: these components would be installed out of water)

Figure 3. Whittier Head of the Bay Cruise Ship Dock Project Proposed Dock Design



1.2.5 Construction Methods

1.2.5.1 Construction Vessels

The following vessels are expected to support construction and protected species monitoring:

- Two materials barges (approximately 250 ft by 76 ft by 15.5 ft) to transport materials from Seattle, Washington to the project site and to be used onsite as a staging area during construction.

- One construction barge (*Swiftwater* crane barge [230 ft by 60 ft by 15.5 ft]) onsite to support construction.
- Two skiffs (20-foot skiffs with single 90 horsepower Honda outboard motors) transported to the project site on the crane barge to support construction and potentially marine mammal monitoring activities.

1.2.5.2 Equipment

The following pile installation equipment is expected to be used (Table 1):

- Vibratory Hammer: ICE 44B/Static weight 12,250 pounds
- Diesel Impact Hammer: Delmag D46/Max Energy 107,280 feet-pounds
- Drilled shaft drill: Holte 100,000 feet-pounds top drive with down-the-hole (DTH) hammer and bit

Table 1. Construction Equipment that will Produce Noise

Driving mechanism	Pile driver	Properties
Vibratory pile driving	ICE 44B/Static weight 12,250 pounds	202 tons centrifugal force 207 tons driving force
Impact pile driving	Diesel Delmag D46	Max energy 107,280 feet-pounds Speed (blows per minute) 34-53
Drilled shaft	Holte Top Drive	Max energy 100,000 feet-pounds

1.2.5.3 Transport of Workers to and from Work Platform

Construction workers would be transported from shore to the barge work platform by skiff. The travel distance would be less than 1,500 feet. There could be multiple shore-to-barge trips during the day; however, the area of travel would be relatively small and close to shore. The protected species observers (PSOs) would use a skiff to observe the action area. Observer protocols including potential skiff-based monitoring were developed in consultation with National Marine Fisheries Service (NMFS) and USFWS and are described in the Marine Mammal Monitoring and Mitigation Plan (4MP; Appendix C). Operation of the PSO skiff was discontinued for winter construction and would be reinstated as weather and sea conditions allow, but would likely not occur until May 2024.

1.2.5.4 Other In-water Construction and Heavy Machinery Activities

The proposed action will involve in-water construction and heavy machinery activities in addition to the activities described above. These include using standard barges and tug boats and positioning piles on the substrate using a crane (i.e., “stabbing the pile”).

1.2.5.5 Construction Sequence

Construction of the project began in May 2023 and would continue into late summer 2024. In-water construction of the floating dock would use the following sequence:

1. Vibrate in 3 to 4 temporary 36-inch diameter steel piles a minimum of 10 feet into overburden to create a template to guide installation of permanent piles. It is anticipated that a few template piles may need to be DTH drilled into place.
2. Weld a frame around the temporary piles.
3. Within the frame, vibrate, impact, and DTH drill permanent 36-inch diameter steel piles into place.
4. Remove the frame and temporary piles and install the next soldier pile, repeating this process for the placement of all of the permanent piles.

Table 2 provides an estimate of time required for pile installation and removal. Section 2.1 below details estimated construction duration.

1.2.5.6 Installation Methods

Installation of Permanent Piles and Dock Components

Pile templates would be constructed using temporary piling vibrated into position. Three or 4 temporary 36-inch diameter piling may need for each template. Most temporary piles would be vibrated into place; however, up to 36 of these may need to make use of a DTH drill in locations where the bedrock is shallow. For each 36-inch temporary pile, an estimated 2 cubic yards (CY) of drill cuttings would be produced.

Using the templates as guides to position the permanent piling, the piling would be vibrated into dense material. The piling would then be driven to tip elevation using an impact hammer. Once the piles achieve the tip elevation, a DTH hammer would be placed inside the piling and a shaft would be drilled into the bedrock. The rock shaft would be filled with concrete to anchor the pile to the bedrock.

The seven (7) permanent 36-inch diameter and eight (8) permanent 48-inch diameter steel piles would be vibrated through the soil layer to bedrock to support other dock components. A 30-inch diameter shaft would be drilled through the 36-inch piles and a 38-inch diameter shaft would be drilling through the 48-inch piles into the bedrock with the DTH hammer and bit, and then filled with concrete to a depth of at least 25 feet to anchor the piles (Appendix A: Sheet 7). For each of the 36-inch and 48-inch permanent piles, an estimated 10 CY of drill cuttings would be produced.

Table 2. Whittier Head of the Bay Cruise Ship Dock Project Pile Installation and Removal Summary

	Temp Pile Installation	Temp Pile Removal	36-Inch Perm Pile Installation	48-Inch Perm Pile Installation	Totals
# of Piles	15	15	7	8	
Diameter of Steel Pile (inches)	36	36	36	48	
Vibratory Pile Driving					
Total Quantity	15	15	7	8	
Max # Piles Vibrated per Day	4	4	4	2	
Vibratory Time per Pile (minutes)	10	10	15	15	
Vibratory Time per Day (minutes)	40	40	60	30	
# of Days	3.75	3.75	1.75	4	13.25
Vibratory Time Total (hours)	2.5	2.5	1.75	2	9
Impact Pile Driving					
Total Quantity	0	0	7	8	
Max # Piles Impacted Per Day	0	0	4	2	
# of Strikes per Pile	0	0	1,800	2,400	
Impact Time per Pile (minutes)	0	0	45	60	
Impact Time per Day (minutes)	0	0	180	120	
# of Days	0	0	1.75	4	5.8
Impact Time Total (hours)	0	0	5.25	8	13.25
Down-the-Hole Drilling					
Total Quantity	10	0	7	8	
Max # Piles Installed Per Day	4	0	2	2	
Time per Pile (minutes)	60	0	150	150	
Time per Day (minutes)	240	0	300	300	
# of Days	2.5	0	3.5	4	10
DTH Drilling Time Total (hours)	10	0	17.5	20	47.5

1.3 ACOUSTIC THRESHOLDS AND ENSONIFIED AREA

Vibratory pile driving, impact pile driving, and DTH drilling would generate in-water and in-air noise that may result in take of northern sea otters. Because there has been no research conducted to establish noise thresholds specifically for sea otters, USFWS uses noise thresholds established by NMFS for otariid pinnipeds to guide development of hazard areas (USFWS 2012; USFWS 2021).

NMFS has developed acoustic thresholds that identify the level of underwater sound above which marine mammals, when exposed to, would be reasonably expected to be behaviorally harassed (Level B harassment) or to incur permanent threshold shift (PTS) to some degree (Level A harassment).

1.3.1 Level A Harassment

NMFS' *Technical Guidance for Assessing the Effects of Anthropogenic Sounds on Marine Mammal Hearing* identifies criteria to assess auditory injury (Level A harassment) from exposure to noise from two sources (impulsive or non-impulsive) to marine mammals based on hearing sensitivity (NMFS 2018). TMC's activity includes the use of impulsive (impact hammer) and non-impulsive (vibratory hammer) noise sources. The thresholds for auditory injury to northern sea otters, based on NMFS's threshold for otariids, are provided in Table 3.

Table 3. Thresholds Identifying the Onset of Permanent Threshold Shift

	PTS Onset Thresholds*(received level)	
Hearing Group	**Impulsive (Impact Pile Driving and DTH/Socketing)**	**Non-impulsive (Vibratory Pile Driving)**
Otariid Pinnipeds, Underwater	$L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	$L_{E,OW,24h}$: 219 dB

Adapted from: NMFS 2018

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.
Note: Peak sound pressure has a reference value of 1 microPascal (µPa), and cumulative sound exposure level (L_E)has a reference value of 1µPa^{2}s. In this table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (otariid pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

1.3.2 Level B Harassment

USFWS uses a noise threshold of 160 dB re 1 µPa for northern sea otters for all pile driving activities.

1.3.3 Calculated Distances to Level A and Level B Thresholds

Distances to the Level A and Level B thresholds were calculated based on various source levels, expressed in sound pressure level (SPL)[1] or sound exposure level (SEL)[2] for a given activity and pile type. For Level A harassment, calculations accounted for the maximum duration of an activity per day using the practical spreading model in the NMFS spreadsheet tool. Distances to thresholds are shown in Table 4 and range from approximately 1 meter to 3.7 km.

1.3.4 Action Area

The action area, or the area near the project that will be directly affected by the action, is the area of water that will be ensonified above acoustic thresholds in a day. In this case, the action area is where noise levels from impact hammer installation of 48-inch (the farthest-reaching noise associated with the project) are expected to decline to 160 dB. As shown in Table 4, this area extends 3.7 km from the source. The action area would be truncated where land masses obstruct underwater sound transmission; thus, the action area extends into Passage Canal approximately 3.7 km and encompasses approximately 8 square km (Figure 4).[3]

In addition to in-water noise, sea otters can be adversely affected by in-air noise. Loud noises can cause hauled-out otters to flush back into the water, leading to disturbance and possible injury. USFWS uses noise thresholds established by NMFS for otariid pinnipeds, which is 100 dB RMS for in-air sound. Pile driving and removal associated with this project will generate in-air noise above ambient levels within Passage Canal; however, the predicted distances to the in-air noise disturbance threshold for hauled-out sea otters will not extend more than 22 meters from any type of pile being vibrated or impacted. [4]

To minimize impacts to protected species, shutdown and monitoring of harassment zones will be implemented to protect and document these species in the action area. Please see Table 4 for calculated distances to the Level A and B thresholds, Appendix B for the Level A and B threshold distance calculation spreadsheets, and Section 11 for mitigation information and

[1] Sound pressure is the sound force per unit µPa, where 1 pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in acoustics is 1 µPa, and the units for underwater sound pressure levels are decibels (dB) re 1 µPa (NMFS 2018).

[2] A measure of sound level that takes into account the duration of the signal (NMFS 2018).

[3] Note, this document also refers to the project vicinity. This term refers to an area larger than the action area, which includes Passage Canal and adjacent waterbodies. This term is used because some of the information available about species with ranges extending into Passage Canal is based on sightings outside the action area.

[4] Predicted distances for in-air threshold distances. The Washington State Department of Transportation has documented un-weighted RMS levels for a vibratory hammer (30-inch pile) to an average 96.5 dB and a maximum of 103.2 dB at 15 meters (Laughlin 2010). Maximum levels were used to extrapolate distances for the project's largest (48-inch-diameter) piles. At the Port of Anchorage, AK, Austin et al. (2016) found source levels of 101 dB at 15 meters during impact installation of 48-inch-diameter steel piles.

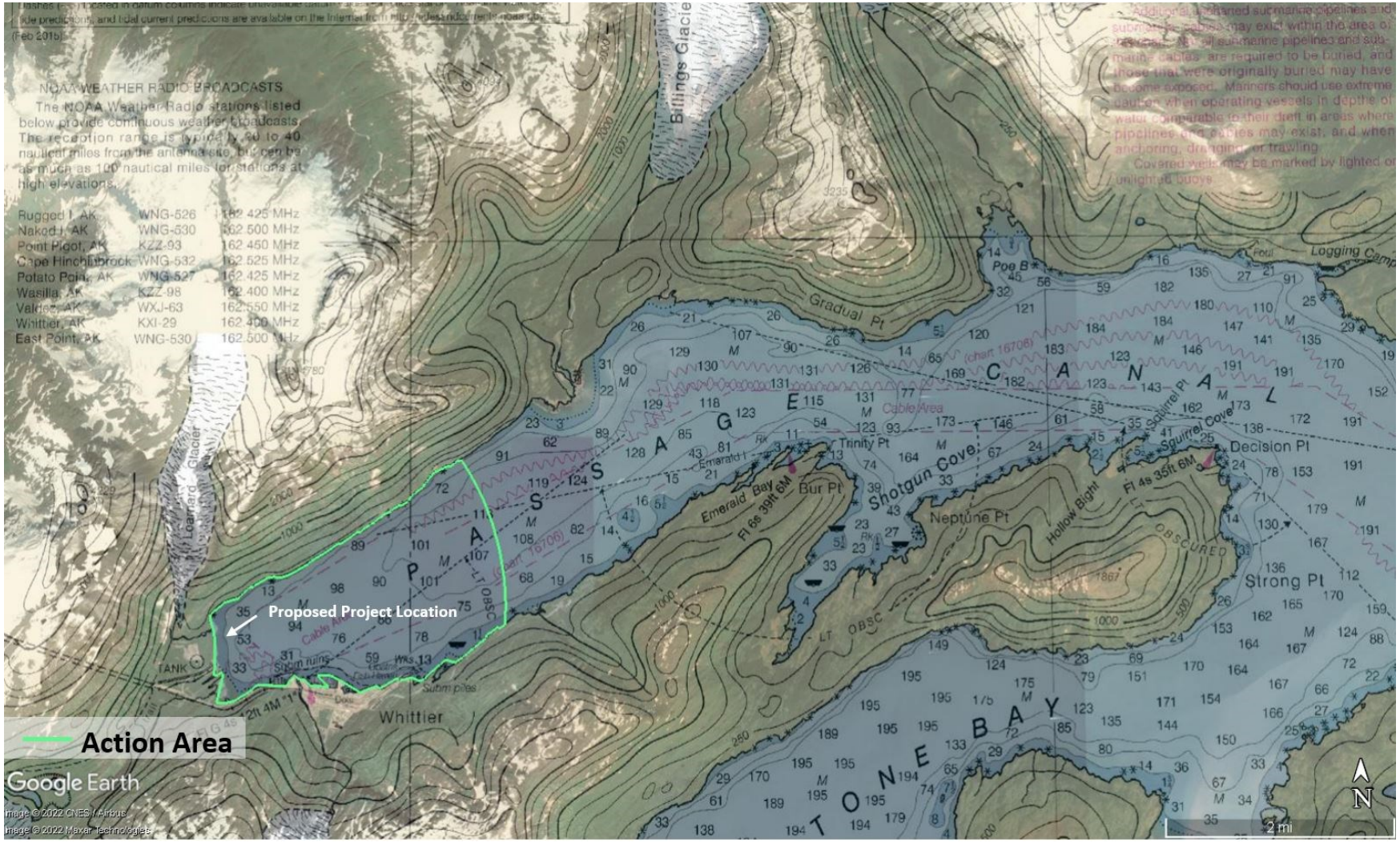
shutdown and monitoring zones and figures. The attached 4MP gives detailed mitigation, shutdown, and monitoring procedures (Appendix C).

Table 4. Calculated Distances to Level A and B Acoustic Thresholds for Northern Sea Otters

Activity	Received Level at 10m	Distance (in meters) to Level A and Level B Thresholds[1]	
		Level A[2]	Level B
Vibratory Pile Driving/Removal			
36-inch temporary pile installation (15 piles; ~40 mins per day on 4 days)	166 RMS[3]	0.5	25
36-inch temporary pile removal (15 piles; ~40 mins per day on 4 days)	166 RMS[3]	0.5	25
36-inch steel permanent installation (7 piles; ~60 mins per day on 2 days)	166 RMS[3]	0.6	25
48-inch steel permanent installation (8 piles; ~30 mins per day on 4 days)	168.2 RMS[4]	0.6	35
Impact Pile Driving			
36-inch steel permanent installation (7 piles; ~180 mins per day on 2 days)	184 SEL/ 192 RMS[5]	169.2	1,359
48-inch steel permanent installation (8 piles; ~120 mins per day on 4 days)	186.7 SEL/ 198.6 RMS[4]	195.4	3,744
DTH Drilling			
36-inch temporary pile installation (10 piles; ~240 mins per day on 2.5 days)	164 SEL[6]/ 167 RMS[7]	57.9	29
36-inch steel permanent installation (7 piles; ~300 mins per day on 3.5 days)	164 SEL[6]/167 RMS[7]	67.1	29
48-inch steel permanent installation (8 piles; ~300 mins per day on 4 days)	171 SEL[8] / 167 RMS[7]	196.6	29

[1] Distances, in meters, refer to the maximum radius of the zone.
[2] The values provided here represent the distance at which an animal may incur PTS if that animal remained at that distance for the entire duration of the activity within a 24-hour period. For example, a sea otter would have to remain 0.9 meters from 42-inch piles being installed via vibratory methods for 1 hour for PTS to occur.
[3] 36-inch temporary pile vibratory installation and removal source levels are proxy from sound measurements from vibratory pile driving of 36-inch piles for the Bangor, Washington waterfront project (U.S. Navy 2015, Table 2-2).
[4] 48-inch vibratory and impact hammer pile source levels are proxy from median measured source levels from vibratory and impact pile driving of 48-inch piles for the Port of Anchorage test pile project (Austin et al. 2016, Tables 9 and 16).
[5] 36-inch impact hammer pile source level is proxy from average of unattentuated measurements from impact installation of 36-inch piles from three projects in Puget Sound presented in U.S. Navy 2015; Table 2-1.
[6] 30- and 36--inch DTH drilling installation SEL is proxy from DTH drilling of 42-inch piles (Reyff 2020; Reyff and Heyvaert 2019; and Denes et al. 2019).
[7] 30-, 36-, and 48-inch DTH drilling installation SPL is proxy from DTH drilling of 24-inch piles (Heyvaert and Reyff 2021)
[8] 48-inch DTH drilling installation SEL was estimated using a logarithmic regression model (Solstice Alaska Consulting, Inc. [SolsticeAK] 2022).

Figure 4. Whittier Head of the Bay Cruise Ship Dock Project Proposed Action Area



2 DATES, DURATION, AND REGION OF ACTIVITY

The date(s) and duration of such activities and the specific geographical region where it will occur.

2.1 DATES AND DURATION

Construction began in May 2023 and is likely to continue through August 2024. Remaining pile installation activities are expected to occur for a total of approximately 68 hours over 30 days (not necessarily consecutive days). See Table 2 for more details about pile installation and removal.

The construction timeline takes into account the mobilization of materials and potential delays due to delayed material deliveries, equipment maintenance, inclement weather, and shutdowns.

2.2 SPECIFIC GEOGRAPHIC REGION

The action area is in the City of Whittier at the head of Passage Canal, a bay of Prince William Sound in Southcentral Alaska. The new dock would be approximately one kilometer (0.75 miles) northwest of downtown Whittier (see Section 1).

2.2.1 Physical Environment

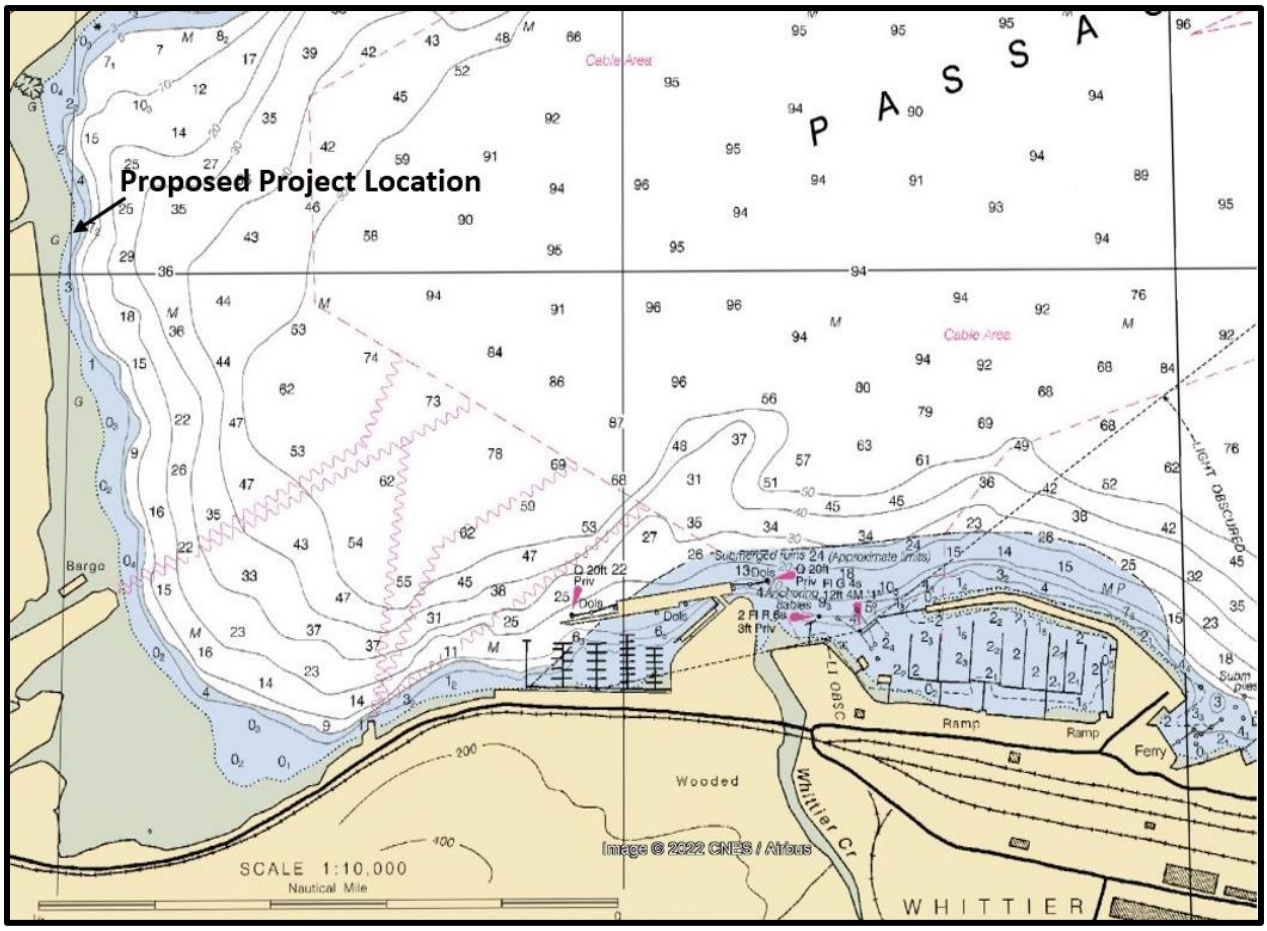
Passage Canal is an approximately 12-mile-long fjord that measures less than 2 miles across from shore to shore at its widest point and reaches depths over 1,000 feet at its entrance near Decision Point and Blackstone Bay. Depths at the head of Passage Canal are shallower, approximately 100 to 200 feet (Figure 5).

According the ShoreZone Mapper (NMFS 2022), the shoreline at the project site has the following characteristics:

- Habitat Class: protected/mobile/sediment
- Coastal Class: sand and gravel flat or fan
- Biological Wave Exposure: protected

Due to turbidity from glacial outwash streams and strong tidal currents and wave action, nearshore kelps and eelgrass (*Zostera marina*) are not well established in Passage Canal (U.S. Army Corps of Engineers [USACE] 2015; SolsticeAK 2022a).

Figure 5. Whittier Head of the Bay Project Area and Bathymetry: Navigational Chart #16706



Source: National Oceanic and Atmospheric Administration (NOAA) 2015

3 AFFECTED SPECIES STATUS AND DISTRIBUTION

A description of the status and distribution of each species or stocks or marine mammals likely to be affected by the activity.

3.1 NORTHERN SEA OTTER

3.1.1 Description and Hearing Ability

Northern sea otters are highly social members of the weasel family, sometimes gathering in groups of hundreds of animals. They are excellent swimmers and spend most of their lives on the water, only occasionally hauling out on land to rest. They forage in nearshore shallow coastal waters for fish or marine invertebrates like clams, mussels, crabs, and octopus, and can dive for prey to depths of up to 250 feet (ADF&G 2022).

There is a lack of data related to frequency range of hearing in the sea otter. Preliminary research efforts to characterize the auditory profile of sea otters indicate that they can detect airborne sound within a range of 0.125 kHz to 32 kHz (Ghoul and Reichmuth 2014), similar to that of the otariid pinnipeds (sea lions). This lends support for grouping northern sea otters with otariid auditory thresholds when considering protection from anthropogenic noise sources such as pile driving.

3.1.2 Status and Abundance

Within Alaska, there are three stocks of the northern sea otter. All three stocks of northern sea otters (Southwest Alaska, Southcentral Alaska, and Southeast Alaska) are protected under the MMPA and one (Southwest Alaska) is listed as threatened under the ESA (70 FR 46366). As sea otters are not migratory, the Southcentral Alaska stock is the only stock expected to be within the project area. Although this stock was significantly affected by the 1989 Exxon Valdez oil spill, it appears that the overall trend in abundance is increasing (Bodkin et al. 2011). The most recent minimum population estimate for this stock is 19,854 animals (USFWS 2023).

3.1.3 Distribution and Presence in Project Area

Historically, sea otters inhabited coastal waters from Baja California north to the coast of southern Alaska, west across the Aleutian Islands to the Kamchatka Peninsula in Russia, and south to the northern islands of Japan. Currently sea otters can be found in Alaska, Russia, British Columbia, Washington, and California (ADF&G 2022). The species is most commonly observed in nearshore areas because the animals require frequent access to benthic foraging habitat in subtidal and intertidal zones (Coletti et al. 2016).

The northern sea otter subspecies is found in the Aleutian Islands, Southern Alaska, British Columbia, and Washington. The Southcentral Alaska stock is found in the coastal waters along the northern coast of the Gulf of Alaska from Cape Yakataga east into Prince William Sound and Cook Inlet along the Kenai Peninsula coast (USFWS 2014). Sea otters are not migratory and generally do not disperse over long distances. Males are territorial, but some have been observed switching from territorial to non-territorial behavior throughout the year, perhaps in search of mating opportunities (Law et al. 2016; Pearson et al. 2006). Annual home range areas of adult sea otters are relatively small, with male territories ranging from less than 1 to 2.5 square kilometers, but males exhibiting non-territorial behavior may travel much farther distances of up to 100 kilometers (Finerty et al. 2010; Garshelis et al. 1984; Jameson 1989). Female sea otters' range is also small, but females move freely among male-occupied territories in search of food resources (Davis et al. 2019).

Although sea otters rest in large groups of 10 to over 1,000 animals, they are commonly seen in smaller groups in the project area (SolsticeAK 2022b). Aerial surveys in Prince William Sound estimates the current sea otter abundance in the Sound at around 10,845 animals (Esslinger et al. 2021).

4 TYPE OF INCIDENTAL TAKE AUTHORIZATION REQUESTED

An estimate of the species and numbers of marine mammals likely to be taken by age, sex, and reproductive conditions, and the type of taking (e.g., disturbance by sound, injury or death resulting from collision, etc.) and the number of times such taking is likely to occur.

The activities outlined in Section 1 have the potential to take marine mammals through exposure to in-water sound. TMC requests the issuance of a second IHA for incidental take by Level A and Level B take of northern sea otters that may occur in the vicinity of the Whittier Head of the Bay Cruise Ship Dock Project during construction.

The applicant requests an IHA for incidental take of northern sea otters for 1 year, beginning on July 19, 2024.

4.1 ESTIMATED TAKE

Incidental take is estimated for each species considering the following:

1) Acoustic thresholds above which USFWS believes sea otters will be behaviorally harassed or incur some degree of permanent hearing impairment;
2) the size of the action area (the area of water that will be ensonified above acoustic thresholds in a day);
3) the density or occurrence of marine mammals in the action area;
4) the number of days of pile driving and removal activity.

Consultation with local whale watching companies, previous marine construction projects in the Whittier area, and available scientific literature are used to estimate the density or occurrence of marine mammals in the action area.

Sea otters may be present in the action area year-round and could be encountered during any given day during construction activities. Occurrence probability estimates are based on conservative density approximations from surveys based in Prince William Sound.

Using the ensonified area as the action area, we multiplied by the sea otter density and by the number of days of each type of pile driving activity for total take estimate.

Estimated take= Action area x sea otter density in Prince William Sound x days of pile driving activity

Disturbance to sea otters caused by the PSOs stationed on a skiff on a transect in Passage Canal (station 4; see Appendix C) was also factored into Level B take estimates. A small number of Level A takes are requested for the larger Level A areas in the event that an otter is not observed in the Level A zone before pile driving could be shut down. Table 5 shows species occurrence information used to estimate take and take calculations. Appendix B includes calculations and assumptions used.

Table 5. Northern Sea Otter Occurrence Information and Take Calculation for the Whittier Head of the Bay Cruise Ship Dock Project

Species	Occurrence Information	Level B Take Estimation[1]
Northern Sea Otter	• Frequently observed in Passage Canal[2] • No large rafts of resting otters observed in Passage Canal • Sea otter density estimated at 2.03 otters per square kilometer in Prince William Sound[3] • Pile driving activities with the smallest isopleths (vibratory, DTH drilling) were left out of take estimates since the possibility of otters venturing into these zones is small • A small number of Level A takes (17) are requested for pile driving activities where the Level A zone is large, in the event that otters are not observed within the Level A zone before pile driving activities could be shut down.	**134**

[1] Figures have been rounded; exact calculations are shown in Appendix B.
[2] SolsticeAK 2022b
[3] Esslinger et al. 2021

5 ANTICIPATED IMPACT OF THE ACTIVITY

The anticipated impact of the activity to the species or stock of marine mammal.

TMC is requesting authorization for Level B take of northern sea otters. Incidental takes of otters will likely be multiple takes of individuals, rather than single takes of unique individuals. Table 6 shows the percent of northern sea otter Southcentral Alaska stock the requested Level A and Level B take represents.

Table 6. Northern Sea Otter Take Requests and Percent of Stock for the Whittier Head of the Bay Cruise Ship Dock Project

Species	Stock/DPS (N_{MIN})[a]	Level A	Level B	Percent of Stock
Northern Sea Otter	Southcentral Alaska (19,854)	17	134	0.6%

[a] Minimum population estimate from USFWS 2023.

Incidental Level B take is expected to primarily result in short-term changes in behavior, such as avoidance of the project area, changes in swimming speed or direction, and changes in foraging behavior. Level B exposure could occur during the 30 days when pile driving and removal would occur. The proposed project would be unlikely to have any impact on stock recruitment or survival because of the limited time that marine mammals could be exposed to Level B

harassment; therefore, the project would have a negligible impact on the stocks of these species.

TMC is requesting minimal Level A take that may occur during impact pile driving or DTH drilling if an otter is not observed within the Level A zone before pile driving could be shut down (see Table 4). Incidental Level A take can cause injury including permanent, partial, or full hearing loss if marine mammals are exposed to underwater sounds exceeding their injury threshold. Marine mammals exposed to high sound levels may experience non-auditory physiological effects such as increased stress, neurological effects, bubble formation, resonance effects, and organ or tissue damage.

Because of the limited area where northern sea otters could experience Level A harassment (260 meters or less), it is not expected that there would be any impact on stock recruitment or survival; therefore, there would be no impact to the stocks of these species.

6 ANTICIPATED IMPACTS ON SUBSISTENCE USES

The anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses.

Alaska Natives have used subsistence resources, including sea otters, in Prince William Sound for thousands of years. The Alutiiq and Eyak people of Prince William Sound traditionally harvested marine mammals, land mammals, birds, shellfish, and fish, mostly salmon and herring. Subsistence harvesting went into sharp decline after the Exxon Valdez Oil Spill of 1989 and full recovery has not yet been achieved (Keating et al. 2020). Today the majority of subsistence species used in Prince William Sound are salmon, halibut, shellfish, and plant species such as wild berries. In recent years there have been declines in the number of households hunting and harvesting larger marine mammals in Prince William Sound; surveys gathering subsistence data found that 5 percent or fewer households harvest or use sea otters (Poe et al. 2010).

The last recorded harvest of marine mammals in Whittier was in 1990, but sea otters were not among the species harvested (ADF&G 2022a). Other Prince William Sound coastal communities such as Cordova, Chenega, and Tatitlek report recent subsistence harvest or use of marine mammals. Subsistence hunters in Prince William Sound report having to travel farther from their home communities to be successful when harvesting marine mammals (Keating et al. 2020). However, their range was not reported to extend into Passage Canal, as all three communities are located at least 60 miles away by boat (Fall and Zimpelman 2016).

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 or to impact subsistence harvest of marine mammals in the region because:

- there is no recent recorded subsistence harvest of sea otters in the area;
- construction activities are localized and temporary;
- mitigation measures will be implemented to minimize disturbance of marine mammals in the action area; and,

- the project will not result in significant changes to availability of subsistence resources.

7 ANTICIPATED IMPACTS ON HABITAT

The anticipated impact of the activity upon the habitat of the marine mammal populations and the likelihood of restoration of the affected habitat.

7.1 PERMANENT HABITAT REMOVAL

The Whittier Head of the Bay Cruise Ship Dock Project would likely not impact any important sea otter habitat since its proposed location is not heavily used by sea otters and is in close proximity to an area currently used by large passenger and shipping vessels, and two active boat harbors. The area is also used year-round by the commercial marine and tourism industries.

7.2 VESSEL TRAFFIC

Tugs and barges will be used to deliver materials to the project site and will remain onsite during project construction. Additionally, small skiffs will be used for day-to-day project operations. Vessels associated with the project will follow well-established, frequently utilized navigation lanes. No direct effects from the minor amount of increased marine vessel activity are anticipated during project construction, particularly since this is an area that currently experiences vessel traffic.

After completion of construction, the marine habitat of Passage Canal and Prince William Sound would experience a minor increase in cruise ship traffic during the summer months after construction completion. The increase in vessel traffic to Passage Canal would be minor, on the order of one to two additional large ships per week, or approximately 45 more ships from May to September (based on 2022 and 2023 Whittier cruise ship schedule; Cruise Line Agencies of Alaska 2022 and 2022a). In turn, if more cruise ship passengers are arriving to Whittier and then taking smaller ships for recreational fishing or whale watching tours, an uptick in the number of small vessel trips may also occur. However, this increase would be minor and localized to the Whittier and Prince William Sound area near Passage Canal. It is unlikely that a small increase in large ships (one to two per week) and smaller tour boats would cause a noticeable impact to available habitat for sea otters.

7.3 TURBIDITY/SEDIMENTATION

A temporary and localized increase in turbidity near the seafloor will occur in the immediate area surrounding dock during the estimated 68 hours (approximate) of in-water project construction. A portion of the in-water work will involve DTH drilling which would also release drill cuttings into the marine environment from above and increase turbidity in the immediate area during pile driving. Construction-induced turbidity is unlikely to measurably affect marine mammal species or prey species in the action area.

As seen on aerial photography (Figure 6) the head of Passage Canal is already turbid due to glacial sediment outfall from Learnard Creek. Due to the existing turbid conditions and the sediment curtain that would be used to contain pile slurry, construction-induced turbidity is unlikely to measurably affect marine mammal species or prey species in the action area.

Figure 6. Existing Turbid Conditions Within the Whittier Head of the Bay Project Area

7.4 NOISE

The project area is subject to noise from many anthropogenic sources, including marine vessels, shoreline construction, and land-based vehicles. Regular use by commercial and recreation vessels, ARRC operations, and the adjacent roadway contribute noise to both the underwater and in-air acoustic baselines in the action area. Beyond Whittier's immediate surroundings, the project action area extends into Passage Canal which is relatively undeveloped.

A temporary loss of sea otter habitat may occur because of elevated noise levels in the project area. Displacement of otters by construction noise is not expected to be permanent nor is it anticipated to have long-term effects on the species. Project activities are not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations, because pile driving and other construction-related noise sources will be temporary and intermittent. However, as discussed below in Section 8.2, minor increased vessel traffic (cruise ships, small recreational/tour vessels) in the area may result in an overall increased level of ambient noise in and near Whittier. This may deter sea otters from inhabiting or traveling through the area. As Passage Canal is not a significant habitat resource for sea otters, the proposed project would not result in northern sea otters losing a significant portion of their habitat.

7.5 LIKELIHOOD OF RESTORATION OF THE AFFECTED HABITAT

It is likely that the habitat outside of the project footprint of the Whittier Head of the Bay Cruise Ship Dock will return to its current condition within a short time because construction of the project would be short term and temporary. The habitat in the footprint of dock will remain permanently affected and not restored.

8 ANTICIPATED EFFECT OF HABITAT IMPACTS ON SEA OTTERS

The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved.

8.1 PERMANENT HABITAT REMOVAL IMPACT ON SEA OTTERS

It should be noted that direct and indirect effects of human activities on sea otters have not been well studied. Sea otters in some areas of Alaska and California frequent human environments and appear to have habituated to human activities. However, sea otters can be sensitive to human disturbance and are frequently described as being "shy" (Richardson and Allen 2000).

Direct impacts such as physical destruction or alteration of habitat for northern sea otters as a result of the project would be minor because the permanent project footprint is relatively small as compared with available marine habitat in Passage Canal.

The direct loss of habitat available to sea otters during construction due to noise, water quality impacts, and other construction activity is expected to be short-term and minimal. In addition, because much of the work would be done in a relatively busy area, where sea otters appear habituated to human activities, the impacts to otters are expected to be minor. Sea otters could become further habituated to vessel activity associated with the project and could inhabit the area surrounding the dock following construction.

8.2 VESSEL TRAFFIC IMPACT ON SEA OTTERS

Vessels transiting the marine environment have the potential to collide with, or strike, marine mammals. Boat strikes are a recurring cause of death across all three stocks of northern sea otters (USFWS 2014). According to Ballachey and Bodkin (2015), there has been an increase in boat strikes in recent years primarily associated with an increase in small recreational boats and larger tourism vessels, which are capable of traveling at relatively high speeds. However, it has been determined in most of these cases that although trauma was the ultimate cause of death, there was a contributing factor, such as disease or biotoxin exposure, which incapacitated the animal and made it more vulnerable to a boat strike.

The probability of strike events depends largely on vessel speed. Project construction vessels will follow well-established, frequently utilized navigation lanes, and vessels will be traveling at slow speeds. As stated above, much of the vessel traffic associated with this project will impact sea otters that appear habituated to human activities; sea otters are not expected to change their behavior in response to vessel traffic associated with this project.

After completion of construction, the marine habitat of Passage Canal and Prince William Sound would experience a minor increase in cruise ship traffic during the summer months after construction completion. This may lead to a small increase in vessel strikes and ambient noise level in Passage Canal. The increase in vessel traffic to Passage Canal would be minor, on the order of one to two additional large ships per week, or approximately 45 more ships from May to September (based on 2022 and 2023 Whittier cruise ship schedule; Cruise Line Agencies of Alaska 2022 and 2022a). In turn, if more cruise ship passengers are arriving to Whittier and then taking smaller ships for recreational fishing or whale watching tours, an uptick in the number of small vessel trips may also occur. However, this increase would be minor and localized to the Whittier and Prince William Sound area near Passage Canal. It is unlikely that a small increase in large ships (one to two per week) and smaller tour boats would cause a noticeable impact to available habitat for sea otters.

8.3 CONSTRUCTION NOISE IMPACTS ON SEA OTTERS

If a sound is loud enough, it may cause discomfort or tissue damage to auditory or other systems of all animals. Sea otters exposed repeatedly or for prolonged periods to high intensity sound can experience a hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges. A TS can be permanent (PTS), in which case hearing sensitivity is not recoverable, or temporary (TTS), in which case the animal's hearing threshold can recover over time (Southall et al. 2007).

Sea otters depend on acoustic cues for vital biological functions (e.g., orientation, communication, finding prey, avoiding predators); thus, TTS may result in reduced fitness in survival and reproduction. However, this depends on the frequency, and duration of TTS, as well as the biological context in which it occurs (Kastak et al. 2005). A TTS of limited duration, occurring in a frequency range that does not coincide with that used for recognition of important acoustic cues, would have little to no effect on an animal's fitness. Although repeated TTS sound exposure could cause PTS, which constitutes injury, USFWS follows NMFS

guidance and classifies TTS as a disturbance (Level B) harassment (Southall et al. 2007; NMFS 2018).

Direct impacts of noise to sea otters depends not only on sound magnitude but also on the species receiving the sound, exposure type (e.g., continuous vs. pulse), duration, site characteristics, and individual animal characteristics such as habituation, season, or motivation (Ellison et al. 2012). Some of the in-water sound source levels from pile installation and removal from the proposed action will generate noise loud enough to harm or harass otters at certain distances. Possible impacts include injury and disturbance ranging from mild (e.g., startle response or masking of species relevant sounds) to severe (e.g., abandonment of habitat).

Auditory interference, or masking, occurs when an interfering noise is similar in frequency and volume to (or is louder than) the auditory signal received by an animal while it is listening for acoustic information from other animals. Masking can interfere with an animal's ability to gather acoustic information about its environment, such as predators, prey, conspecifics, and other environmental cues (Francis and Barber 2013).

Construction activities of the proposed project could mask vocalizations or other important acoustic information experienced by sea otters present in the action area. This could affect communication among individuals or affect their ability to receive information from their environment (Erbe et al. 2019). However, the primary effects of project activities will occur in an active waterway, where masking from vessel sounds and dock activity is likely.

Effects from acoustic disturbance may arise from construction-related vessel traffic, and may temporarily contribute to elevated ambient levels of underwater and in-air noise in the action area. Tugs and barges can emit significant noise levels, around 171-176 dB (Richardson et al. 1995; Kipple and Gabriele 2004); modern commercial ships give broadband source levels (20–1000 Hz) as high as 188 dB re 1µPa @ 1 m for a 54,000 gross ton container ship traveling at 21.7 knots (McKenna et al. 2013). Otters in the area are currently exposed to these sounds.

In general, impacts from this project to sea otters are expected to be minor and temporary. The area likely impacted by the proposed project is relatively small compared to the available habitat around Passage Canal.

8.4 TURBIDITY IMPACTS ON SEA OTTERS

Sea otters could be impacted by turbidity associated with the project due to temporary sediment suspension and increased turbidity associated with in-water activities. Studies on the impacts of increased turbidity to sea otters are limited. As discussed above, this area of Passage Canal experiences heightened levels of turbidity due to glacial outwash from Learnard Creek. It is expected that area of increased turbidity would be very small compared to the available habitat in Passage Canal and short lived; therefore, it is not expected that a temporarily more turbid habitat would have major or lasting impacts to northern sea otters.

8.5 IMPACTS ON SEA OTTER PREY

Northern sea otters feed primarily on marine invertebrates like clams, mussels, crabs, octopus, and fish. The impacts of underwater sound on fish are well understood; however, impacts on

species further down the food chain that are important prey species for fish are not as well studied.

Corbett (2019) studied the effect of pile driving noise on the crab species *Carcinus maenas* in lab experiments. They found that crabs did not significantly differ in their oxygen consumption or hemolymph parameters in response to pile-driving noise and ambient sound. However, in the behavioral feeding experiment, crab behavior was significantly altered, including increased time spent immobile and decreased likelihood to feed. A 2015 study examined the impacts of sound produced by seismic air guns on marine invertebrates. Seismic air guns produce low frequency, high intensity underwater sound ranging from 156dB re 1 µPa2 s−1 to 183dB re 1 µPa2 s-1 approximately 509 meters to 658 meters from the source. The seismic air gun used in this study is within or below the range of pile installations equipment that will be deployed during the Whittier Head of the Bay Cruise Ship Dock Project and results have been translated to assessments of pile-driving noise on marine species (Corbett 2019). The results indicate that there was an increased mortality in adult and larval zooplankton and total mortality of larval krill (adults were not present) (McCauley et al. 2017).

Fish populations in the project area that serve as sea otter prey could be affected by noise or turbidity generated from in-water pile-driving. High underwater sound pressure levels have been documented to alter behavior, cause hearing loss, and injure or kill individual fish by causing serious internal injury (Popper and Hawkins 2019). Temporary and localized turbidity associated with the proposed project may cause displacement of small schooling fish from the construction area; however, such distribution shifts are likely to be temporary and it is expected that fish will return after of pile driving is complete. It is expected that most fish will be able to move away from the proposed activity to avoid harm and will still be available to marine mammals as a food source. The quantity, quality, and availability of adequate food resources are therefore not likely to be reduced (due to the small area affected, mobility of fish, anticipated recolonization, and the temporary nature of the project).

Since turbidity and strong tidal currents preclude establishment of rooted marine vegetation such as nearshore kelps and eelgrass in Passage Canal (USACE 2015; SolsticeAK 2022a), prey resources are limited in this area as compared to other areas within Prince William Sound. Therefore, the likelihood of attracting significant numbers of marine mammals to habitat within Passage Canal is decreased and the probability that the proposed project would impact a significant amount of habitat for those species is diminished.

In general, impacts to prey species are expected to be minor and temporary. The area impacted by the project is very small compared to the available habitat in Passage Canal and Prince William Sound. The most likely impact to prey will be temporary behavioral avoidance of the immediate area. Fish and marine mammals are expected to temporarily move to nearby locations during pile driving and return to the area following cessation of in-water construction activities; therefore, indirect effects on marine mammal prey during construction are not expected to be substantial.

8.6 INDIRECT HABITAT IMPACTS

Indirect effects to turbidity levels in Passage Canal would not be expected from an increased number of cruise ships docking at the proposed facility, since cruise ships would naturally be traveling slowly through the area as they arrive at the docking facility and lower speeds generate less sediment resuspension (Jones 2011). Water depths in Passage Canal are generally greater than 15 meters, further reducing the potential for sediment disturbance from ship motors, and this along with strong tidal currents in the area lower potential for turbidity impacts since sediment is dispersed more quickly (NOAA 2015, USACE 2015).

9 MITIGATION MEASURES

The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Mitigation measures and construction techniques will be employed to minimize effects to marine mammal species and habitat. These measures are described below and presented in detail in the TMC Whittier Head of the Bay Cruise Ship Dock Project 4MP (Appendix C).

9.1 MITIGATION MEASURES DESIGNED TO REDUCE PROJECT IMPACTS

The project uses the most compact design possible while meeting the demands of the vessels that would use the facility.

- The project uses a design that will not use dredging or blasting.
- The project uses a design that minimizes pile diameters, amount of piles, and footprint to the greatest extent practicable.

9.2 OIL AND SPILL PREVENTION

- The contractor will develop a spill response plan prior to start of any in-water work.
- The contractor will provide and maintain a spill cleanup kit on-site at all times, to be implemented as part of the Oil Pollution Emergency Plan for oil spill prevention and response.
- Fuel hoses, oil drums, oil or fuel transfer valves and fittings, and similar equipment would be checked regularly for drips or leaks and maintained and stored properly to prevent spills.
- Oil booms will be readily available for oil or another containment should a release occur.
- All chemicals and petroleum products will be properly stored to prevent spills.
- No petroleum products, cement, chemicals, or other deleterious materials will be allowed to enter surface waters.

9.3 MITIGATION MEASURES DESIGNED TO REDUCE IMPACTS TO NORTHERN SEA OTTERS

- Pile caps (pile softening material) will be used to minimize noise during impact pile driving. Much of the noise generated during pile installation comes from contact between the pile and the steel template used to stabilize the pile. The contractor will

use high-density polyethylene or ultra-high-molecular-weight polyethylene softening material on all templates to eliminate steel-on-steel noise.

-
- Turnagain will attempt to minimize the use of an impact hammer to the extent possible by utilizing a vibratory hammer to advance the piling as deep as possible prior to switching to impact driving.
- Turnagain will also employ pile caps and a 60-foot-deep bubble curtain during impact pile driving to reduce noise impacts. Sound source levels used in the application to estimate sound isopleths and action areas were not reduced due to use of either the pile caps or bubble curtain.
- The contractor is required to conduct briefings for construction supervisors and crews and the monitoring team prior to the start of all pile driving activity, and upon hiring new personnel, to explain responsibilities, communication procedures, the marine mammal monitoring protocol, and operational procedures.
- The contractor is required to employ PSOs during all in-water construction activities.
- Marine mammal monitoring must take place starting 30 minutes prior to initiation of pile driving and ending 30 minutes after completion of pile driving activity. Pile driving may commence when observers have declared the shutdown zone clear of marine mammals. In the event of a delay or shutdown of activity resulting from marine mammals in the shutdown zone (Table 7), their behavior must be monitored and documented until they leave of their own volition, at which point the activity may begin or resume.
- In-water work would only occur during daylight hours.
- Pile driving must be halted or delayed if a marine mammal is observed entering or within an established shutdown zone (Table 7). Pile driving may not commence or resume until either: the animal has voluntarily left and has been visually confirmed beyond the shutdown zone; 15 minutes have passed without subsequent observations of small cetaceans and pinnipeds; or 30 minutes have passed without subsequent observations of large cetaceans.
- The contractor must use soft start techniques when impact pile driving. Soft start requires contractors to provide an initial set of strikes at reduced energy, followed by a thirty-second waiting period, then two subsequent reduced energy strike sets. A soft start must be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer.
- Pile installation and removal must be delayed or halted immediately if a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized takes are met, is observed approaching or within the monitoring zone (Table 7). Activities must not start or resume until the animal has been confirmed to have left the area or the observation time period, as indicated in the conditions above, has elapsed.
- NMFS manages a number of marine mammal species that are found in the action area. A separate IHA request is being submitted to NMFS concurrently with this application to obtain permission to take to other species under their jurisdiction.

9.4 SHUTDOWN AND MONITORING ZONES

TMC is requesting Level B take for northern sea otters incidental to construction of the Whittier Head of the Bay Project. Shutdown and monitoring zones pertaining to sea otters described in the following sub-sections would be implemented to avoid Level A take of northern sea otters.

9.4.1 Level A Shutdown Zones

There will be a nominal 10-meter shutdown zone for construction-related activity where acoustic injury is not an issue. This type of work could include (but is not limited to) the following activities:

- movement of the barge to the pile location;
- positioning of the pile on the substrate via a crane (i.e., stabbing the pile); or
- the placement of sound attenuation devices around the piles.

For these activities, monitoring would take place from 15 minutes before initiation until the action is complete.

TMC is requesting a small number of Level A take and will implement additional shutdowns to protect northern sea otters from Level A harassment and prevent auditory injury during all in-water activities as shown in Table 7 and Figure 7.

9.4.2 Level B Monitoring Zones

TMC is requesting Level B take of northern sea otters incidental to constructing the proposed cruise ship berth. Shutdowns associated with Level B harassment of these species are not proposed. Calculated distances to Level B thresholds will reach their full extent; however, where land masses block sound transmission distances will be truncated. The monitoring zones associated with Level B disturbance are outlined in Table 7 and Figure 8.

If species other than those listed above approach or appear likely to enter the Level B area, in-water work would be shut down.

Table 7. Whittier Head of the Bay Cruise Ship Dock Project Sea Otter Level A Shutdown Zones and Level B Monitoring Zones

Activity	Received Level at 10m	Distance (in meters) to Level A and Level B Thresholds[1]	
		Level A	Level B
In-water Construction Activities			
Barge movements, pile positioning, etc.[2]	171-176 dB[3]	10	--
Vibratory Pile Driving/Removal			
36-inch temporary pile installation	166 RMS[4]	15	25
36-inch temporary pile removal	166 RMS[4]	15	25
36-inch steel permanent installation	166 RMS[4]	15	25
48-inch steel permanent installation	168.2 RMS[5]	15	35
Impact Pile Driving			
36-inch steel permanent installation	184 SEL/ 192 RMS[6]	170	1,360
48-inch steel permanent installation	186.7 SEL/ 198.6 RMS[5]	200	3,745
DTH Drilling			
36-inch temporary pile installation	164 SEL[7]/ 167 RMS[8]	70	30
36-inch steel permanent installation	164 SEL[7]/ 167 RMS[8]	70	30
48-inch steel permanent installation	171 SEL[9] / 167 RMS[8]	200	30

[1] Shutdown zone distances refer to the maximum radius of the zone and are rounded.
[2] This shutdown zone applies to all construction activities but is only shown in Figure 7. Although acoustic injury is not the primary concern with these activities, shutdowns will be implemented to avoid impacts to species.
[3] Richardson et al. 1995; Kipple and Gabriele 2004
[4] U.S. Navy 2015, Table 2-2
[5] Austin et al. 2016, Tables 9 and 16
[6] U.S. Navy 2015, Table 2-1
[7] Reyff 2020; Reyff and Heyvaert 2019; and Denes et al. 2019
[8] Heyvaert and Reyff 2021; SolsticeAK 2022b).
[9] SolsticeAK 2022b

Figure 7. Whittier Head of the Bay Cruise Ship Dock Project Level A Shutdown Zones

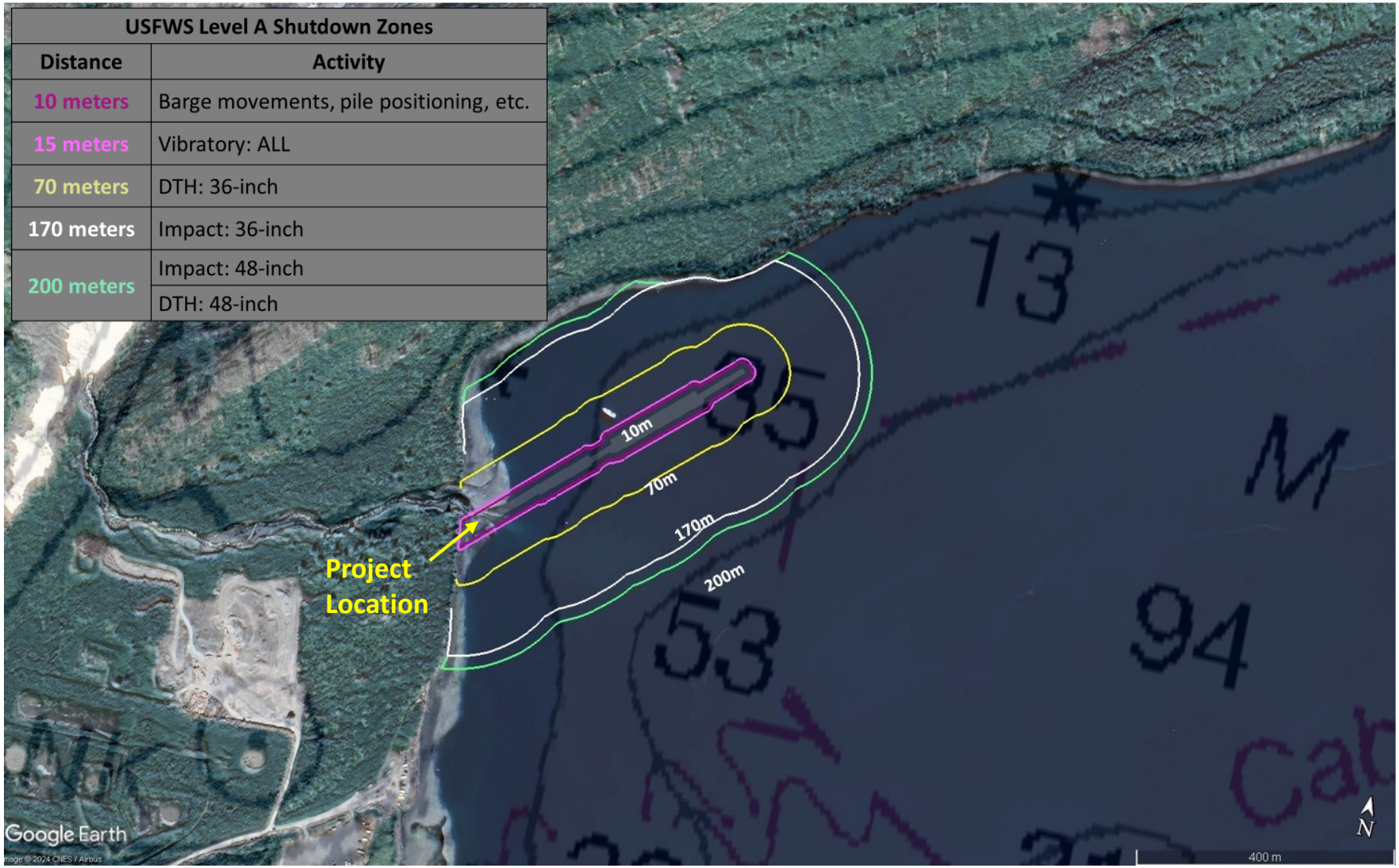
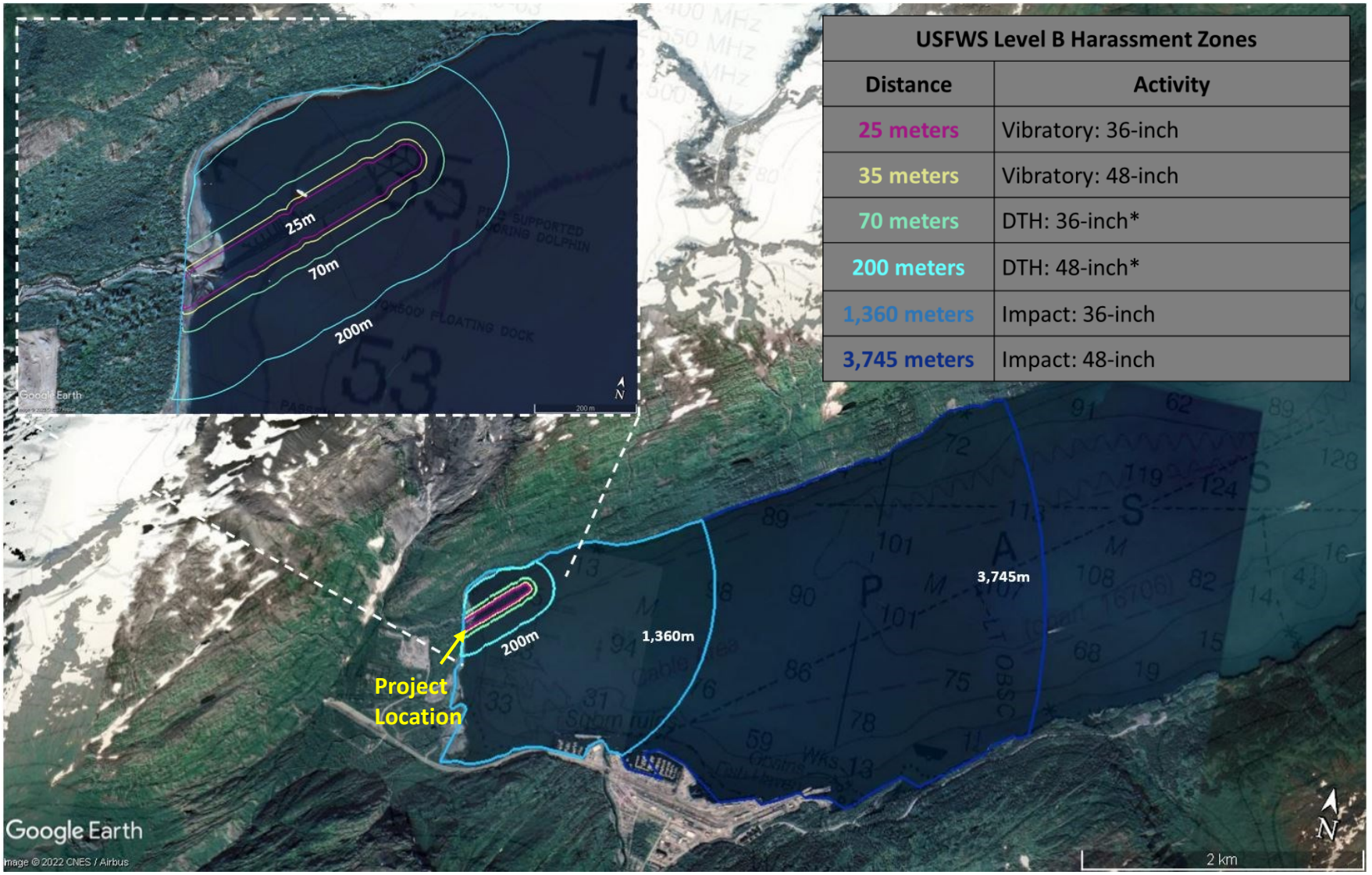


Figure 8. Whittier Head of the Bay Cruise Ship Dock Project Level B Monitoring Zones



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

10 MITIGATION MEASURES TO PROTECT SUBSISTENCE USES

Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, you must submit either a plan of cooperation (POC) or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses.

No activities associated with the proposed project would take place in or near traditional Arctic subsistence hunting areas. As described in Section 8, although there are subsistence uses of marine mammals in Prince William Sound and there were subsistence harvests of marine mammals near the community of Whittier in the past, subsistence harvest of marine mammals has not been recorded near Whittier since 1990.

11 MITIGATION MEASURES CONSIDERED AND DISMISSED

- Avoidance of in-water work during times when Pacific salmon smolt are entering or leaving freshwater streams in the project area (between April 15 and June 1; between July 15 and September 15) was considered as a mitigation measure. However, IHAs are only valid for one year after issuance. Due to harsh weather patterns in Passage Canal, particularly in the winter months, and hours of winter daylight, work would need to continue through the summer to be completed within a year timeframe.
- A bubble curtain was considered for all pile driving activities. It was determined that since depths at the project site are extreme, effectiveness of the bubble curtain would be diminished as ocean depths increase. A bubble curtain to 60 feet deep is proposed for impact pile driving activities.

12 MONITORING AND REPORTING

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding.

12.1 MONITORING PROTOCOLS

To minimize impacts of project activities on marine mammals, a detailed 4MP has been developed for the project and is included as Appendix C. Project shutdown and monitoring zones as outlined in Appendix C and Section 11.3 would be implemented during any in-water pile driving activities associated with the project. If the number of animals of a species exposed to Level A or B harassment approaches the number of takes allowed by the IHA, TMC will notify USFWS and seek further consultation.

12.2 MONITORING REPORT

TMC will submit a draft report to USFWS no later than 90 days following the end of construction activities or 60 days prior to the issuance of any subsequent IHA for the project. TMC will provide a final report within 30 days following resolution of USFWS' comments on the draft report. Reports will contain, at minimum, the following:

- Date and time that monitored activity begins and ends for each day when monitoring is conducted (monitoring period)
- Construction activities occurring during each daily observation period, including how many and what type of piles were driven
- Deviation from initial proposal in pile numbers, pile types, average driving times, etc.
- Weather parameters in each monitoring period (e.g., wind speed, percent cloud cover, visibility)
- Water conditions in each monitoring period (e.g., sea state, tide state);
- For each marine mammal sighting:
  - Species, numbers, and, if possible, sex and age class of marine mammals
  - Description of any observable marine mammal behavior patterns, including bearing and direction of travel and distance from pile driving activity
  - Type of construction activity that was taking place at the time of the sighting;
  - Locations of marine mammals and their distance from pile driving activities the observation point
  - Reason shutdown was implemented (if needed)
  - If shutdown was implemented, behavioral reactions noted and whether they occurred before or after shutdown
  - Estimated amount of time that the animals remained in the Level A or B zone
- Description of implementation of mitigation measures within each monitoring period (e.g., shutdown or delay)
- Other human activity in the area within each monitoring period
- A summary of the following:
  - Total number of individuals of each species detected within the Level B Zone and estimated as taken
  - Total number of individuals of each species detected within the Level A Zone and estimated as taken
  - Daily average number of individuals of each species detected within the Level B Zone and estimated as taken

TMC will also immediately report injured or dead sea otters to USFWS, and, if the specified activity clearly causes the take of marine mammals in a manner prohibited by the IHA (e.g., serious injury or mortality), TMC will immediately cease pile activities and report the incident to USFWS.

13 SUGGESTED MEANS OF COORDINATION

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.

In-water and in-air noise generated by vibratory, impact, and DTH pile driving at the Whittier Head of the Bay site is the primary issue of concern to local marine mammals during this project. Potential impacts on marine mammals have been studied, with the results used to establish the noise criteria for evaluating take.

The data recorded during marine mammal monitoring for the proposed project will be provided to USFWS in the monitoring report (Section 12.2). The report will provide information on marine mammals' use of Passage Canal, including numbers before, during, and after pile driving activities. The monitoring data may also inform USFWS and future permit applicants generally about the behavior of marine mammals during pile installation and removal for future projects of a similar nature.

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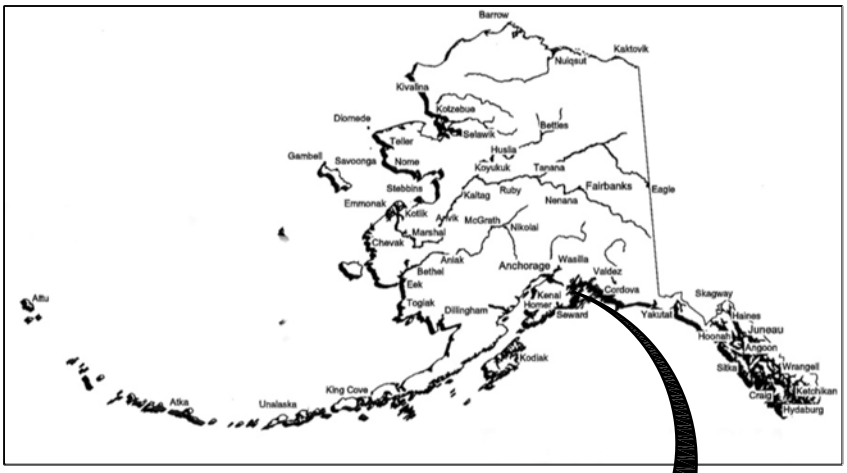
APPENDIX A

PROJECT DRAWINGS



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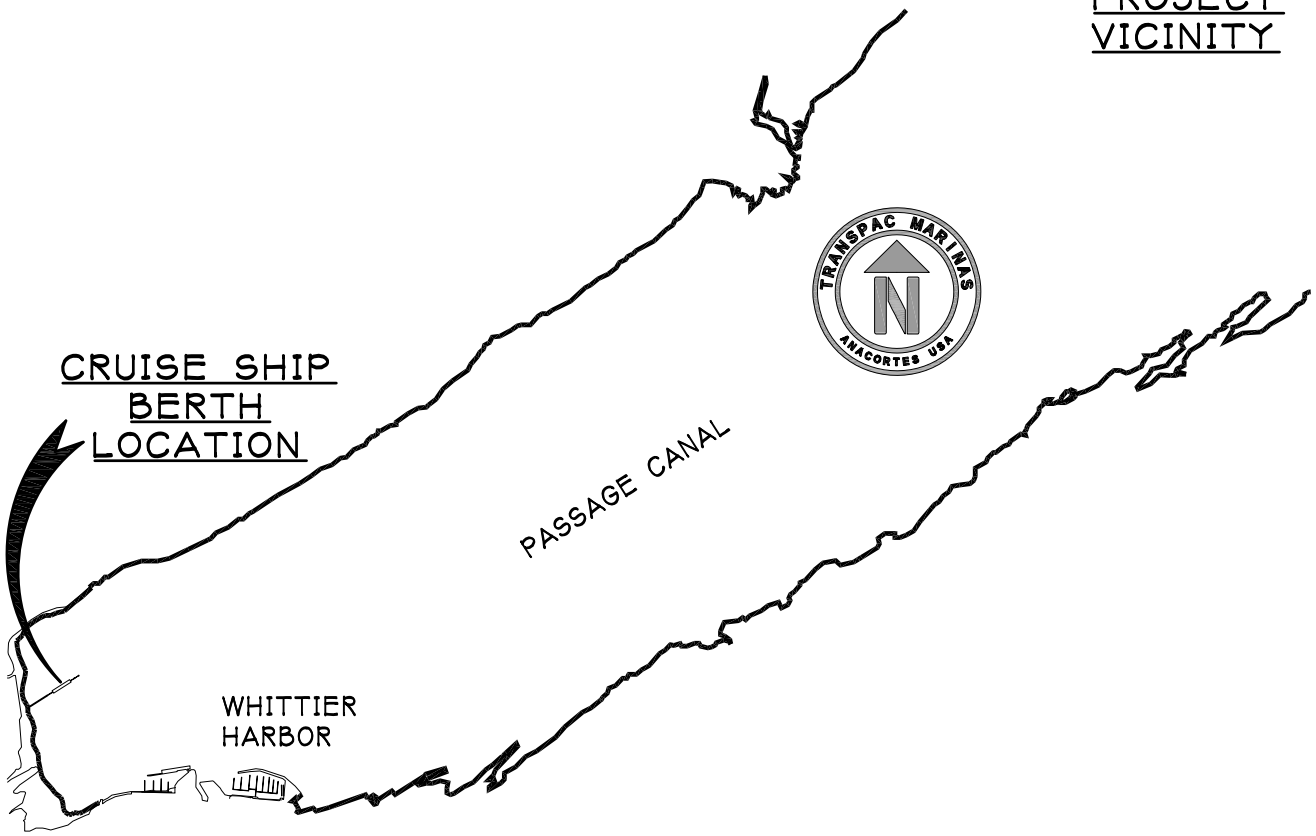
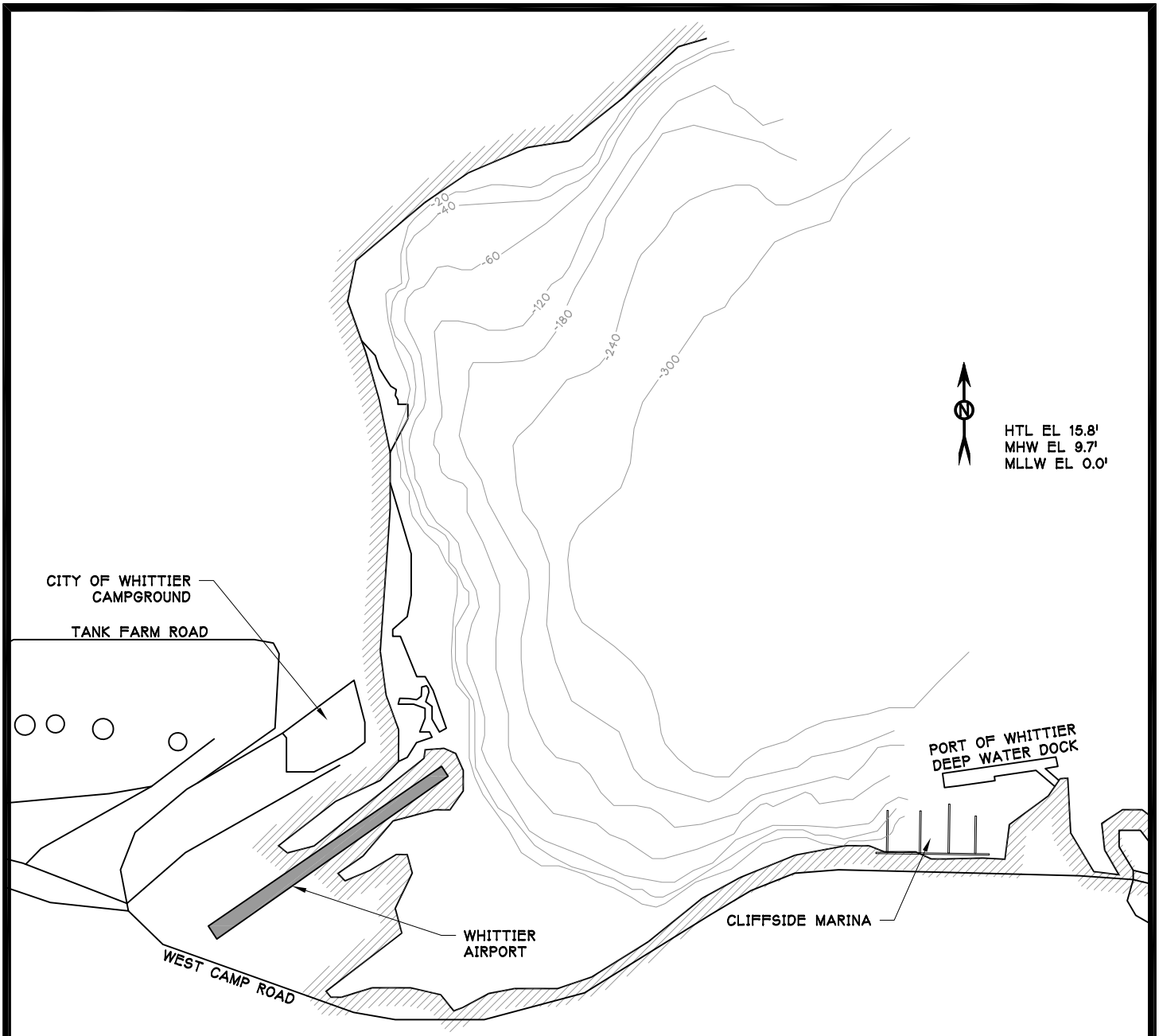


PURPOSE: NEW CRUISE SHIP DOCK	VICINITY MAP & LOCATION MAP	PROPOSED: CRUISE SHIP DOCK
		IN: PASSAGE CANAL
		AT: WHITTIER, AK
DATUM: 0.0 MTL = 5.55 MHW = 9.71 MLLW = 0.0'	JOB NO. 2288	APPLICATION BY: TURNAGAIN MARINE
		DATE: 2 SEPTEMBER 2022 SHEET: 1 OF 9



PURPOSE: NEW CRUISE SHIP DOCK

DATUM: 0.0'

MTL = 5.55'
MHW = 9.71'
MLLW = 0.0'

EXISTING SITE CONDITIONS

JOB NO. 2288

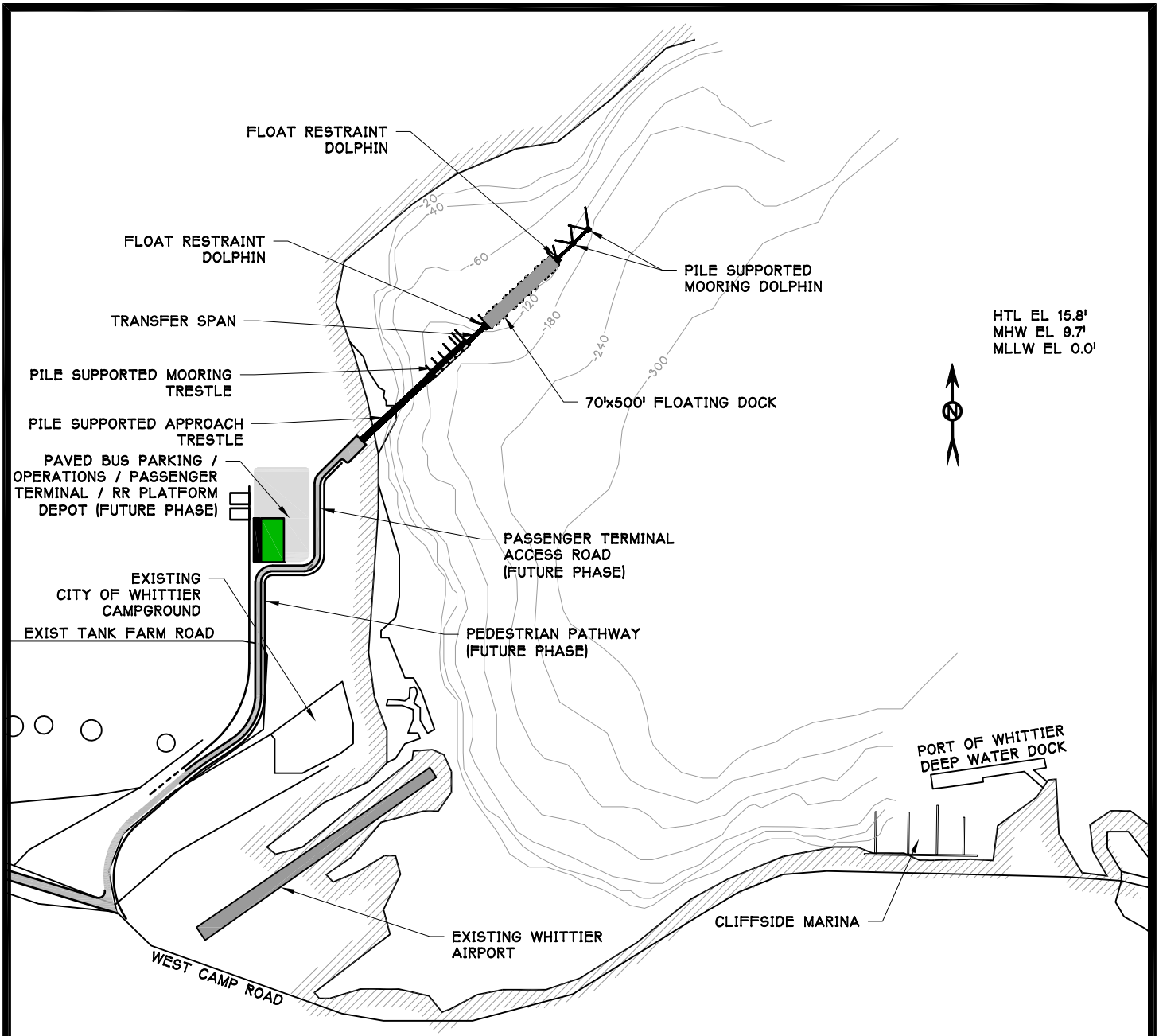
PROPOSED: CRUISE SHIP DOCK

IN: PASSAGE CANAL

AT: WHITTIER, AK

APPLICATION BY: TURNAGAIN MARINE

DATE: 2 SEPTEMBER 2022



PURPOSE: NEW CRUISE SHIP DOCK

DATUM: 0.0' MTL = 5.55' MHW = 9.71' MLLW = 0.0'

PROPOSED SITE PLAN

JOB NO. 2288

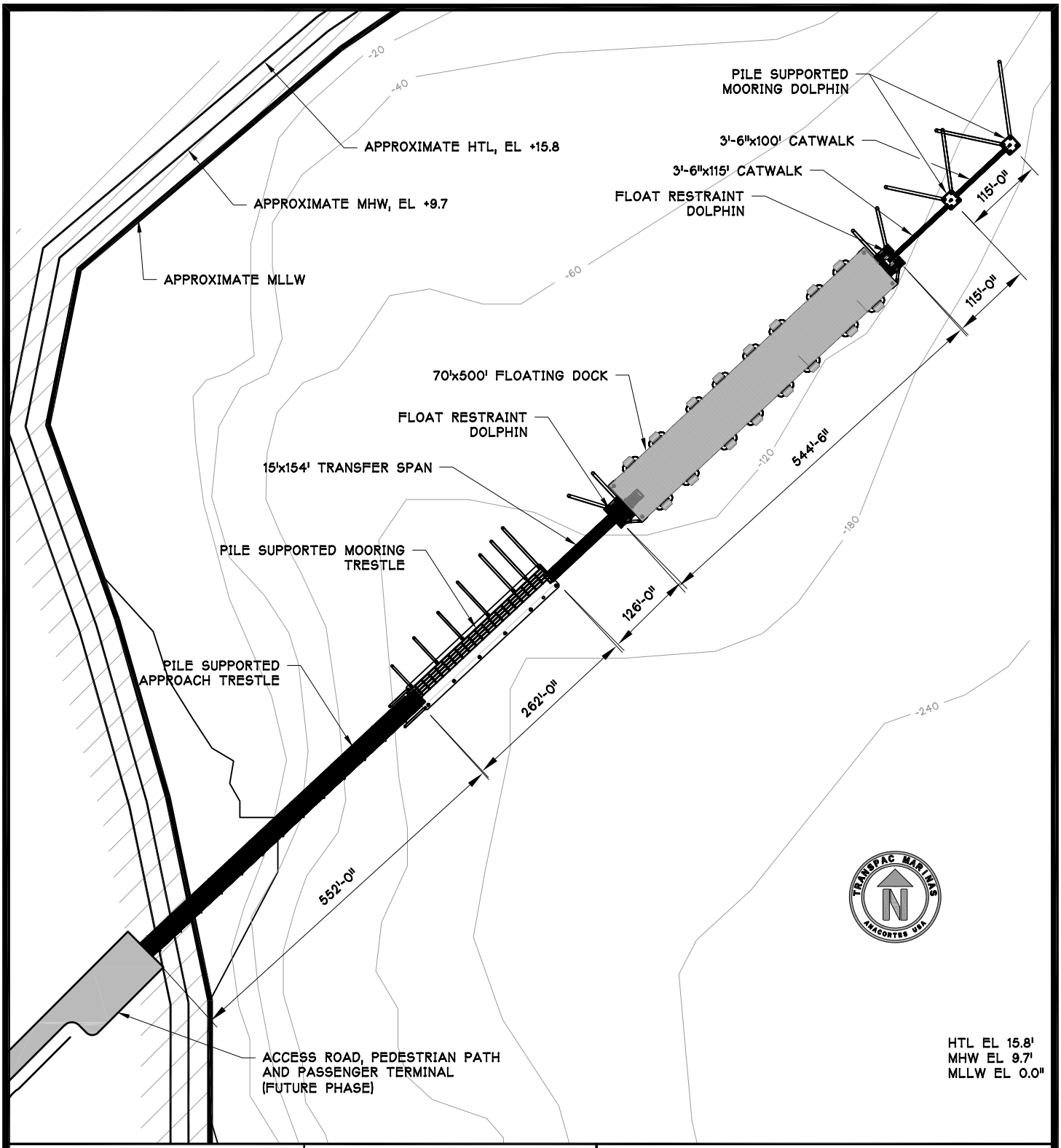
PROPOSED: CRUISE SHIP DOCK

IN: PASSAGE CANAL

AT: WHITTIER, AK

APPLICATION BY: TURNAGAIN MARINE

DATE: 2 SEPTEMBER 2022 SHEET: 3 OF 9



PURPOSE: NEW CRUISE SHIP DOCK

DATUM: 0.0' MTL = 5.55' MHW = 9.71' MLLW = 0.0'

PROPOSED BERTH SITE PLAN

JOB NO. 2288

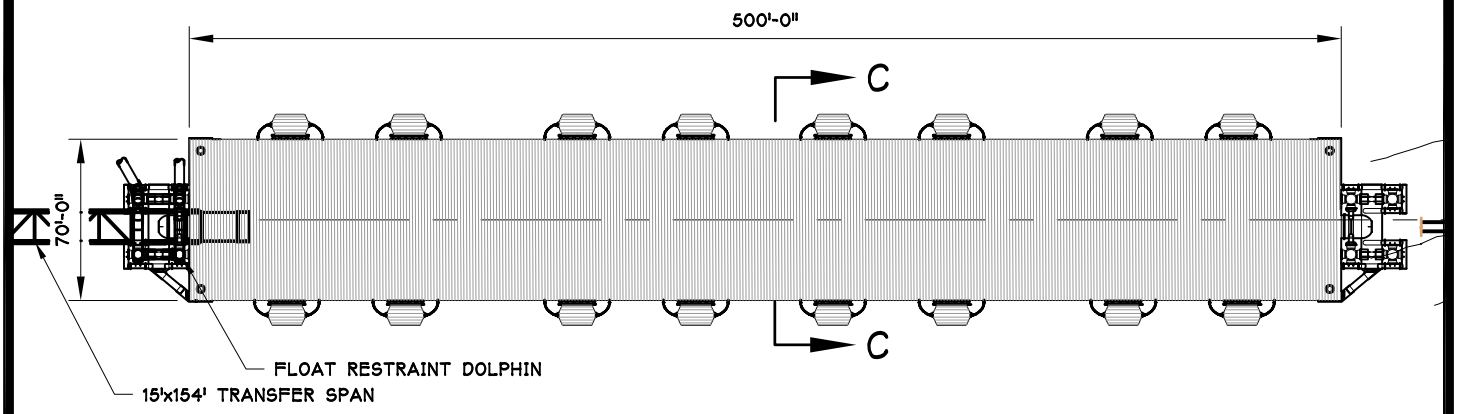
PROPOSED: CRUISE SHIP DOCK

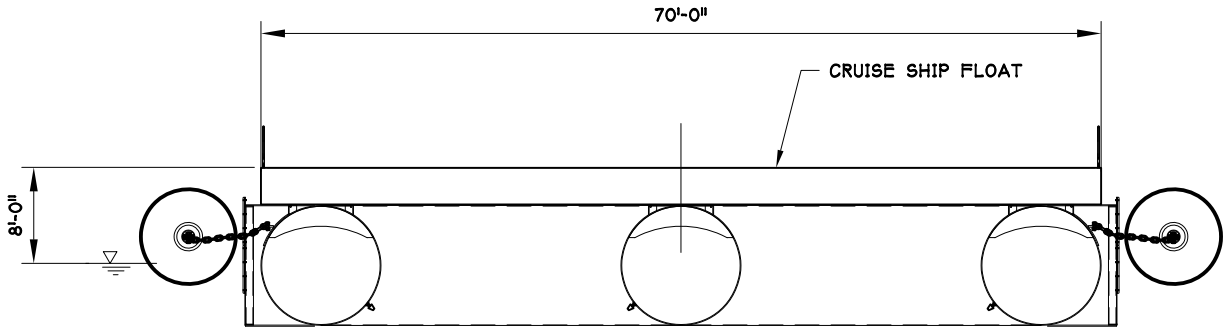
IN: PASSAGE CANAL

AT: WHITTIER, AK

APPLICATION BY: TURNAGAIN MARINE

DATE: 2 SEPTEMBER 2022 SHEET: 4 OF 9



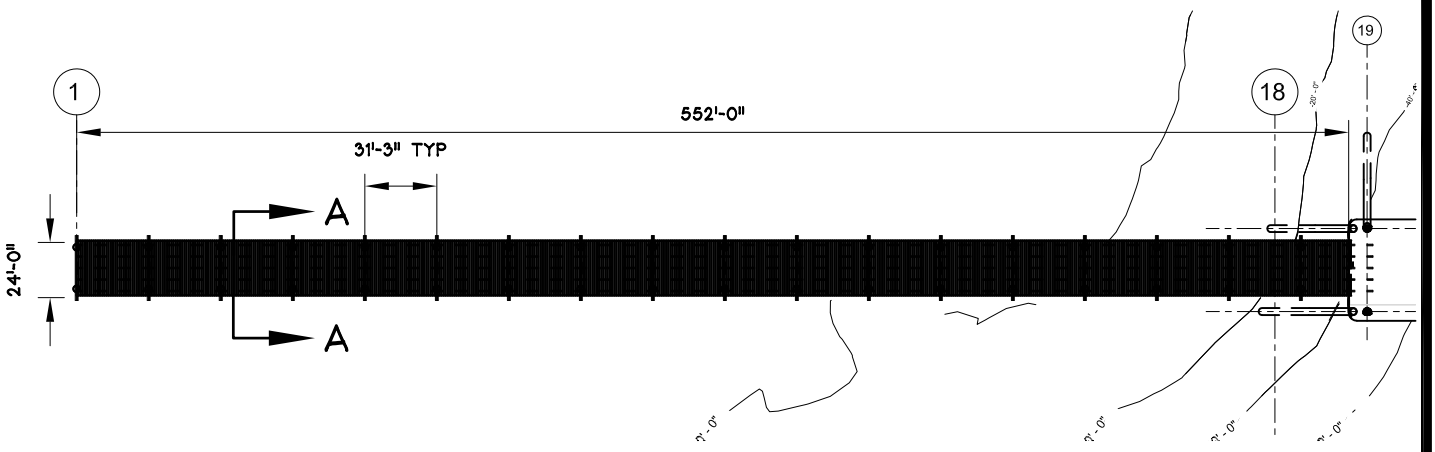


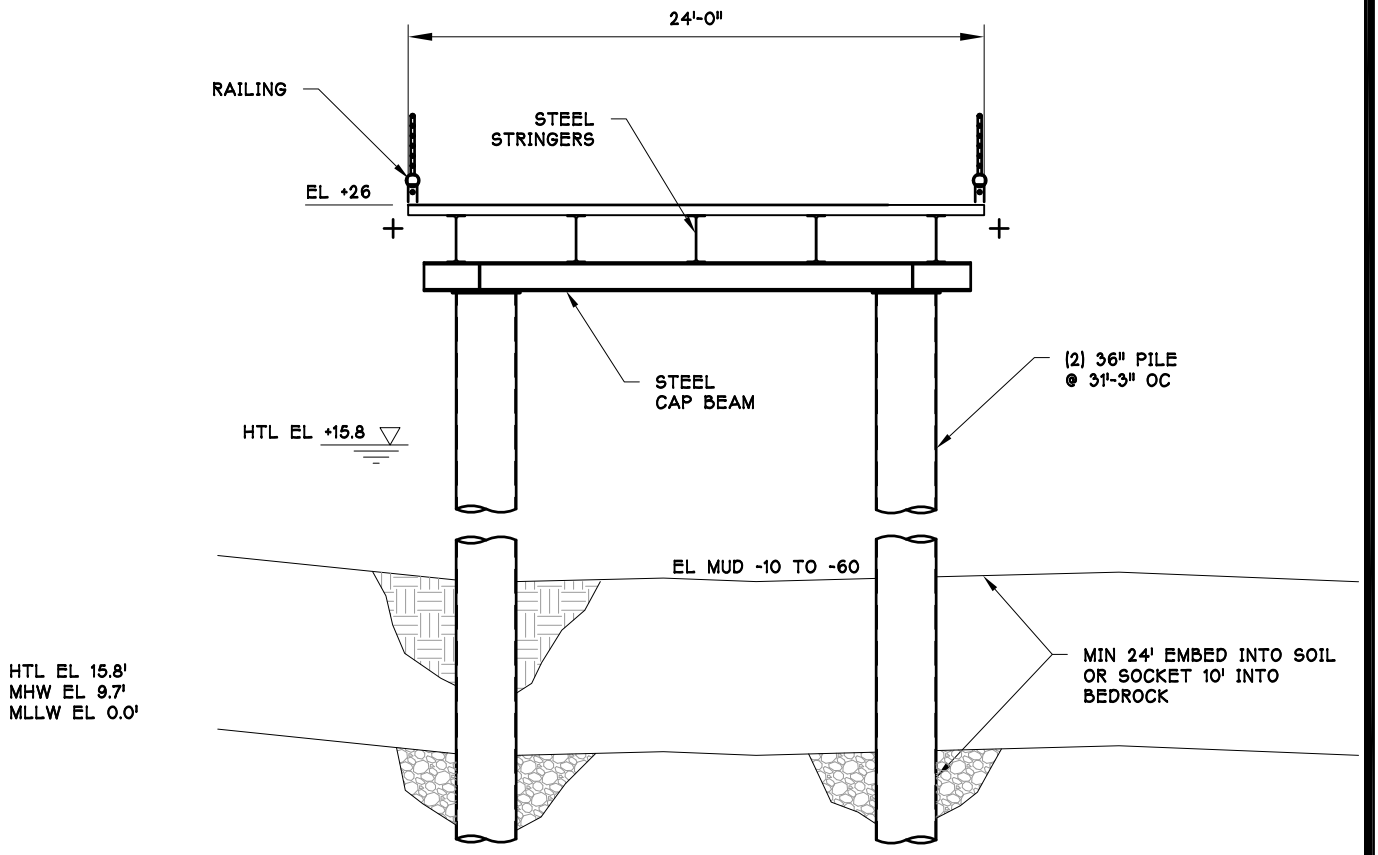
HTL EL 15.8'
MHW EL 9.7'
MLLW EL 0.0'

MUDLINE APPROX EL -50'

TYPICAL FLOAT SECTION C - C

PURPOSE: NEW CRUISE SHIP DOCK	PROPOSED FLOAT PLAN & SECTION	PROPOSED: CRUISE SHIP DOCK
		IN: PASSAGE CANAL
		AT: WHITTIER, AK
DATUM: 0.0' MTL = 5.55' MHW = 9.71' MLLW = 0.0'	JOB NO. 2288	APPLICATION BY: TURNAGAIN MARINE
		DATE: 2 SEPTEMBER 2022 SHEET: 5 OF 9

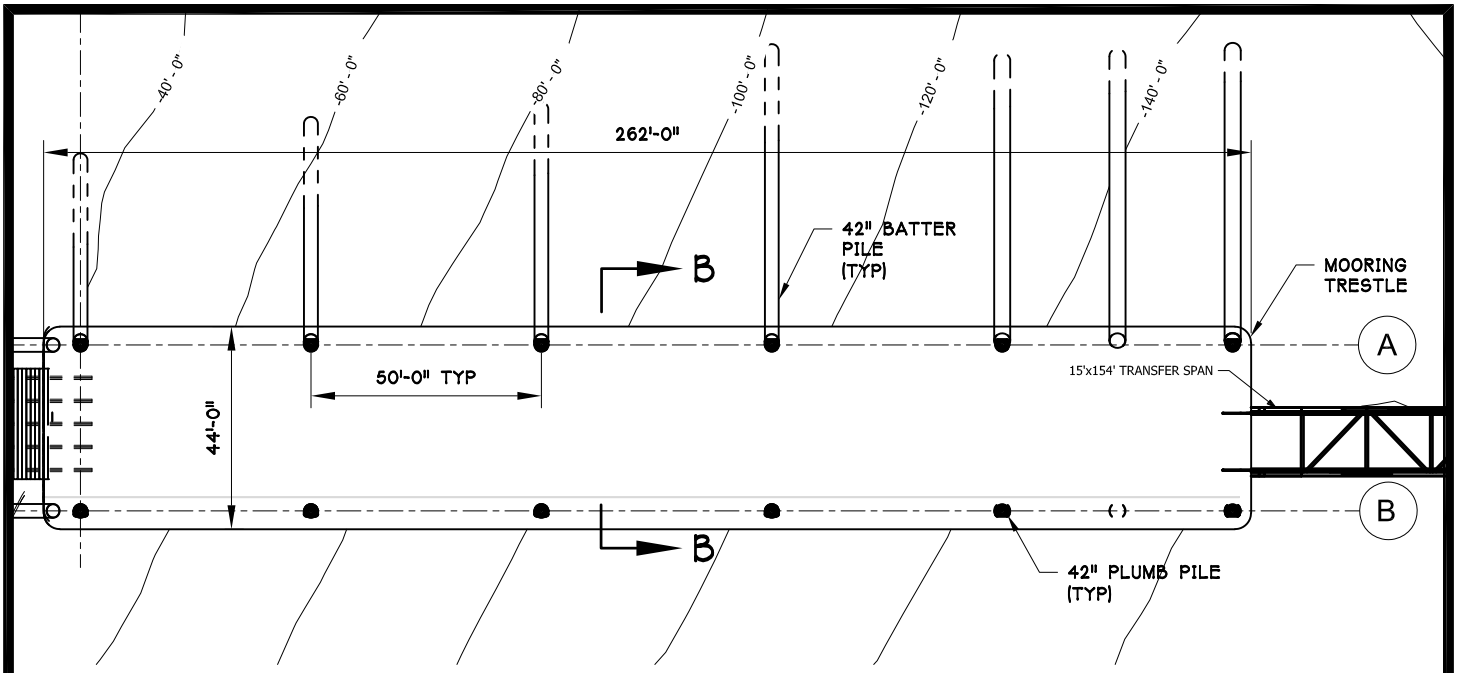


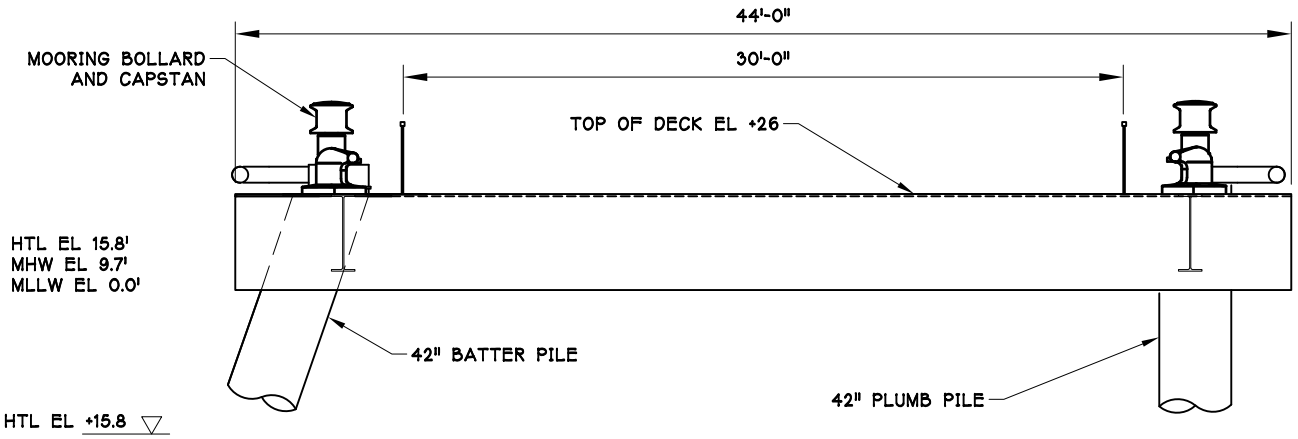


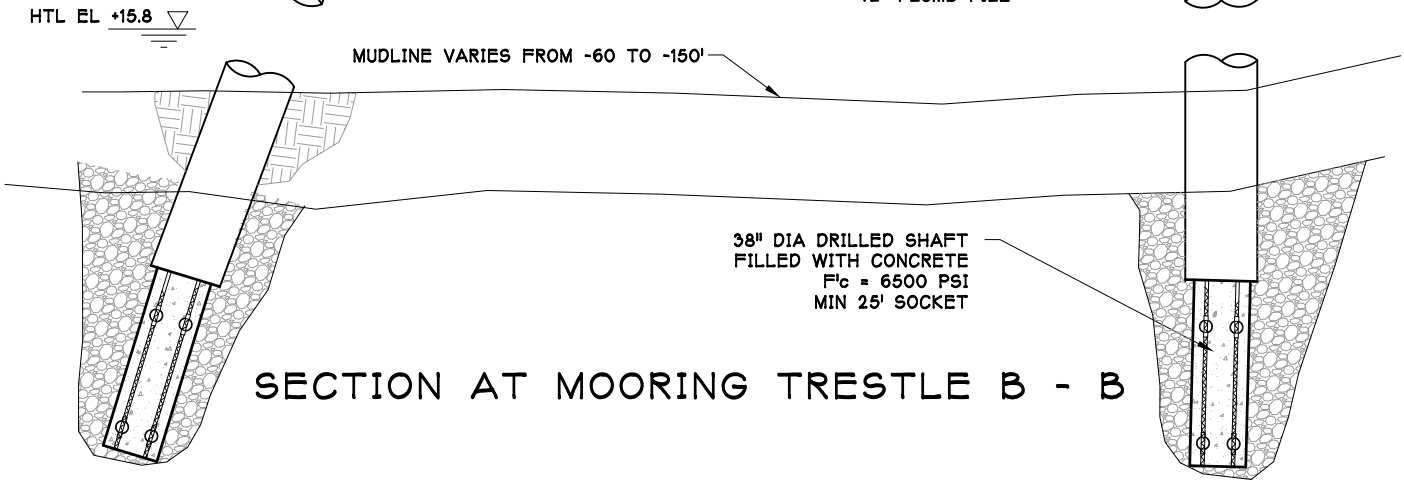
SECTION AT APPROACH TRESTLE A - A

PILE BENTS @ 31'-3" OC

PURPOSE: NEW CRUISE SHIP DOCK	PROPOSED APPROACH TRESTLE	PROPOSED: CRUISE SHIP DOCK
		IN: PASSAGE CANAL
		AT: WHITTIER, AK
DATUM: 0.0' MTL = 5.55' MHW = 9.71' MLLW = 0.0'	JOB NO. 2288	APPLICATION BY: TURNAGAIN MARINE
		DATE: 2 SEPTEMBER 2022 SHEET: 6 OF 9

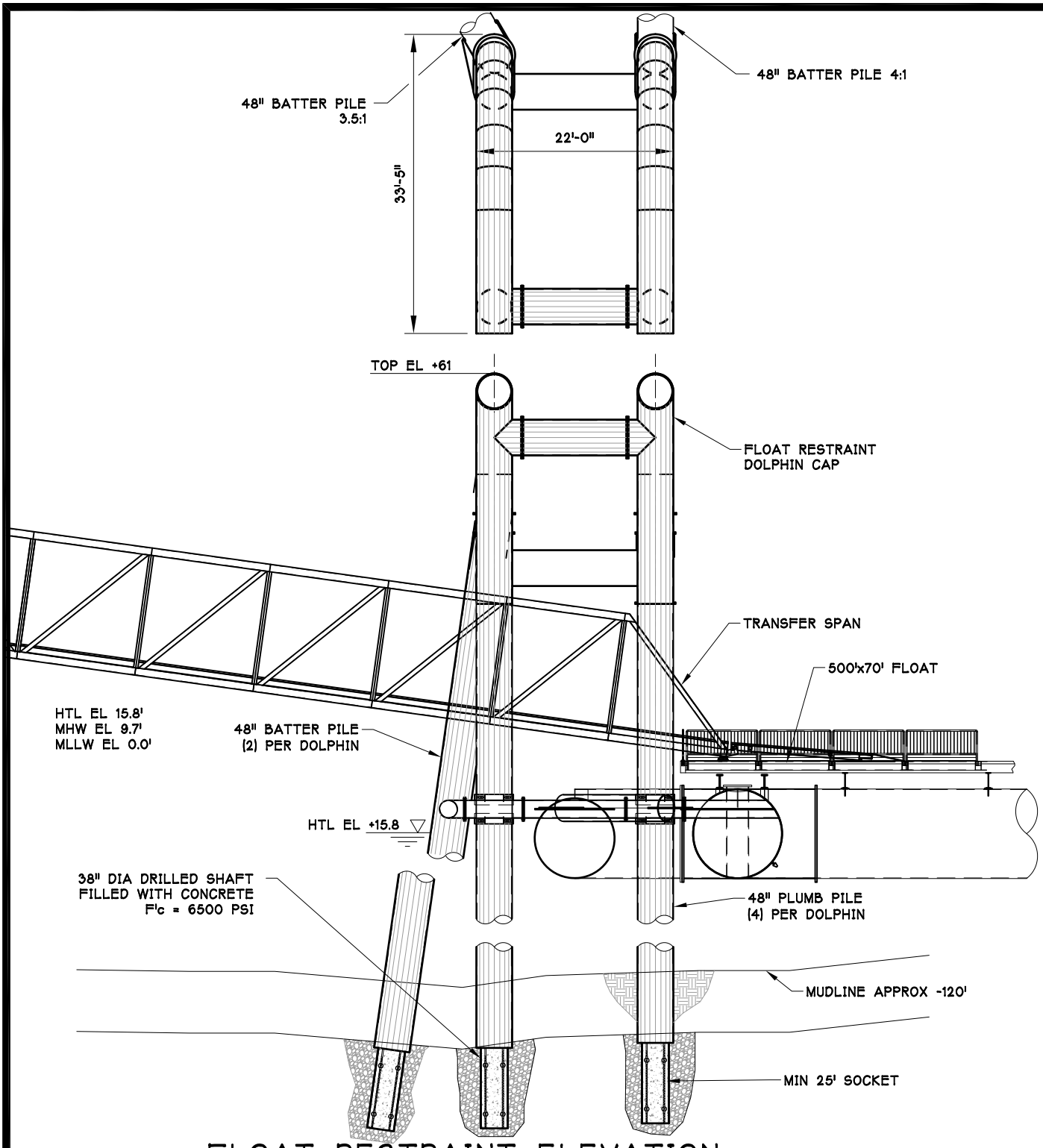






SECTION AT MOORING TRESTLE B - B

PURPOSE: NEW CRUISE SHIP DOCK	PROPOSED MOOORING TRESTLE	PROPOSED: CRUISE SHIP DOCK
		IN: PASSAGE CANAL
		AT: WHITTIER, AK
DATUM: 0.0' MTL = 5.55' MHW = 9.71' MLLW = 0.0'	JOB NO. 2288	APPLICATION BY: TURNAGAIN MARINE
		DATE: 2 SEPTEMBER 2022 SHEET: 7 OF 9



FLOAT RESTRAINT ELEVATION

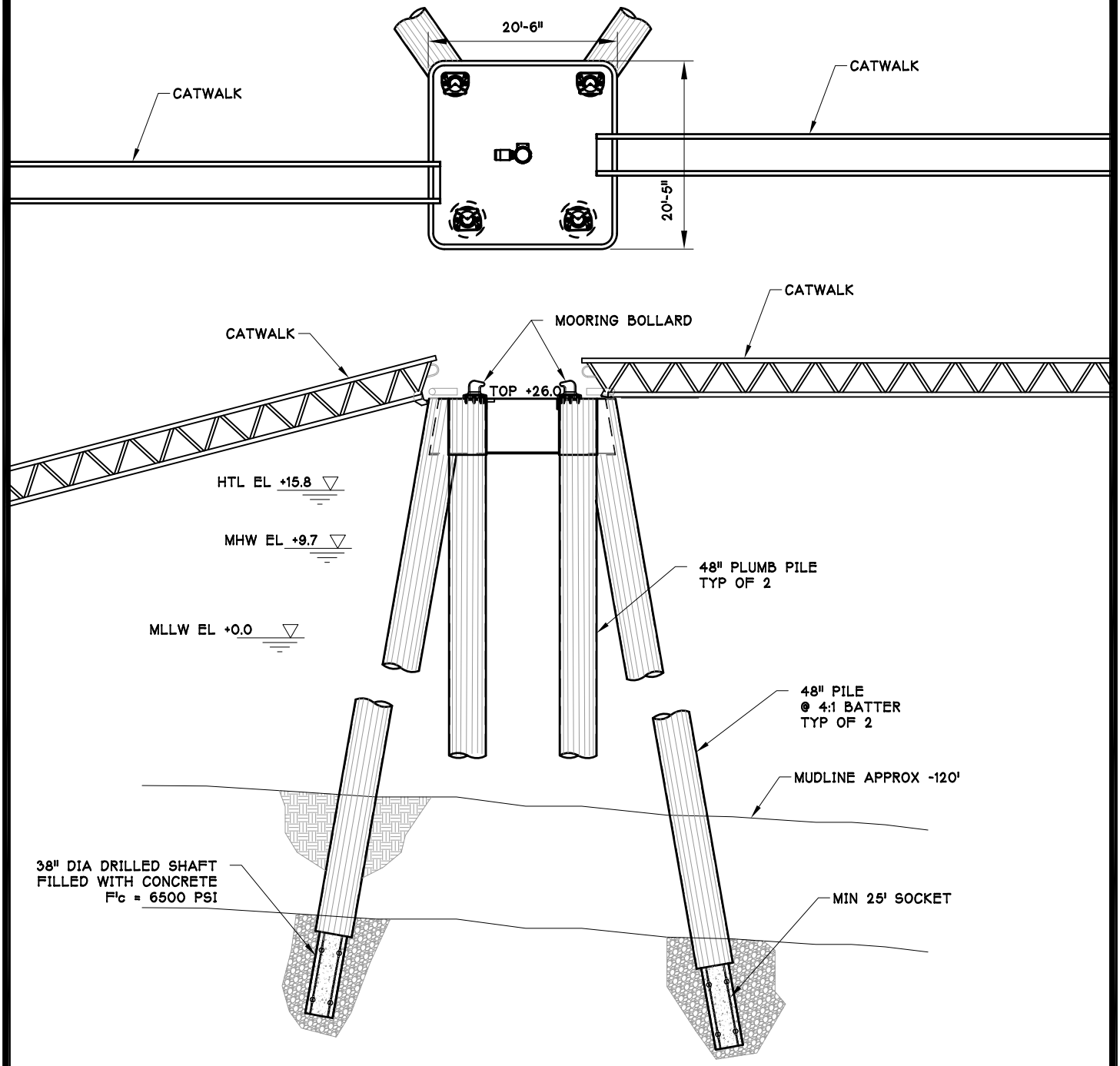
PURPOSE: NEW CRUISE SHIP DOCK

DATUM: 0.0' MTL = 5.55' MHW = 9.71' MLLW = 0.0'

PROPOSED
FLOAT RESTRAINT

DOLPHIN
JOB NO. 2288

PROPOSED: CRUISE SHIP DOCK
IN: PASSAGE CANAL
AT: WHITTIER, AK
APPLICATION BY: TURNAGAIN MARINE
DATE: 2 SEPTEMBER 2022 SHEET: 8 OF 9



MOORING DOLPHIN

PURPOSE: NEW CRUISE SHIP DOCK	PROPOSED MOORING DOLPHIN	PROPOSED: CRUISE SHIP DOCK
		IN: PASSAGE CANAL
		AT: WHITTIER, AK
DATUM: 0.0' MTL = 5.55' MHW = 9.71' MLLW = 0.0'	JOB NO. 2288	APPLICATION BY: TURNAGAIN MARINE
		DATE: 2 SEPTEMBER 2022 SHEET: 9 OF 9

APPENDIX B

THRESHOLD AND TAKE CALCULATION SPREADSHEETS

Project Pile Size (inches)	Installation method	Proxy Pile Size	Proxy Sound Source @ m			Weighting Factor	Project Source Specific Information (Level A Spreadsheet)				Reference	Link to Document	Notes
			RMS/SPL	SEL	PK		# of piles in 24-hour	Duration (mins)	TLC	Distance of Measurement			
36 - temporary	Vibratory	36	159 @ 10m			2.5	4	15	15	10	Sound measurements from 36-inch piles at the WETA downtown ferry project, San Francisco (Illingworth & Rodkin 2018) Also presented in Table I.2 - 1a. of Caltrans 2020.	https://media.fisheries.noaa.gov/dam-migration/wetasfferry_2018iha_acousmonrep_opr1.pdf	similar shallow driving depth (i.e., 2-3 m of water) as project
36 - removal of dolphin piles	Vibratory	36	159 @ 10m			2.5	4	45	15	10	Sound measurements from 36-inch piles at the WETA downtown ferry project, San Francisco (Illingworth & Rodkin 2018) Also presented in Table I.2 - 1a. of Caltrans 2020.	see above	
48	Vibratory	48	168.2 @ 10m			2.5	4	45	15	10	48-inch unattentuated vibratory hammer installation during Port of Anchorage Test Pile Program (Austin et al. 2016; Table 16)	https://www.portofalaska.com/wp-content/uploads/APMP-TPP_Kiewit-Final-Report.pdf	higher SPL than the generic given in NMFS spreadsheet
36	Impact	36	192 @ 10m	184 @ 10m	211 @ 10m	2	4	900 strikes/pile	15	10	Proxy Source: average of unattentuated measurements from impact installation of 36-inch piles from three projects in Puget Sound presented in Proxy Source Sound Levels and Potential Bubble Curtain Attenuation for Acoustic Modeling of Nearshore Marine Pile Driving at Navy Installations in Puget Sound (NAVFAC 2015; Table 2-1)	https://media.fisheries.noaa.gov/dam-migration/navymsm_2018rule_appappendices_opr1.pdf	
48	Impact	48	194 @ 10m	166 @ 10m	182 @ 10m	2	4	1500 strikes/pile	15	10	48-inch unattentuated impact hammer installation during terminal replacement project in Antioch, CA (Caltrans 2020)	https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/hydroacoustic-manual-a11y.pdf	Max energy of the proposed impact hammer is less than used for POA (Austin et al. 2016) and similar to the Caltrans 2020 (used APE D80 impact hammer) so Caltrans was used
36 - temporary	DTH	42	167 @ 10m	164 @ 10m		2	4	10 strikes/second (60 minutes)	15	10	**Level A:** 42-inch piles from Reyff & Heyvaert, 2019; Reyff, 2020; and Denes et al., 2019 **Level B:** 24-inch pile from Tenakee Springs Heyvaert & Reyff (2021)	Level A: https://media.fisheries.noaa.gov/dam-migration/ctjvthimbleshoals_final_ssv_report_opr1_3-23.pdf	
36 - permanent	DTH	42	167 @ 10m	164 @ 10m		2	2	10 strikes/second (150 minutes)	RMS: 19.1 SEL:15	10			
48	DTH	48	167 @ 10m	171 @10m		2	2	10 strikes/second (150 minutes)	15	10	**Level A:** Using a logarithmic regression model we suggest that an appropriate source level for a 48-in pile would be 170.73 (or 171) dB SELss. **Level B**: 24-inch pile from Tenakee Springs Heyvaert & Reyff (2021)	Email Guidance from NMFS	
All Piles	In-air Vibratory	30	103.2 @15m								In-air vibrating sound source is the following: the Washington State Department of Transportation has documented un-weighted rms levels for a vibratory hammer (30-inch pile) to an average 96.5 dB and a maximum of 103.2 dB at 15 meters (Laughlin 2010). Maximum levels were used to extrapolate distances for the projects.	https://wsdot.wa.gov/sites/default/files/2021-10/Env-Noise-MonRpt-AirborneVibratory.pdf	
All Piles	In-air Impact	48	101 @15m								In-air impacting sound source is the following: the Port of Anchorage, AK, Austin et al. (2016) found source levels of 101 dB at 15 meters during impact installation of 48-inch-diameter steel piles.	https://www.portofalaska.com/wp-content/uploads/Test_Pile_Noise_Vibrat_Analysis_Aug26_2016.pdf	

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Whittier Head of the Bay Cruise Ship Dock Project
PROJECT/SOURCE INFORMATION	Sound measurements from 36-inch piles at the Bangor, Washington waterfront project. Presented in Table 2-2 of Proxy Source Sound Levels and Potential Bubble Curtian Attentuation for Acoustic Modeling of Nearshore Marine Pile Driving at Navy Installations in Puget Sound (U.S. Navy 2015).

Please include any assumptions

PROJECT CONTACT	Carrie Connaker (carrie@solsticeak.com)

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)¥	2.5	default

¥Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	166
Number of piles within 24-h period	4
Duration to drive a single pile (minutes)	10
Duration of Sound Production within 24-h period (seconds)	2400
10 Log (duration of sound production)	33.80
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	10

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**11.2**	**1.0**	**16.6**	**6.8**	**0.5**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjus
they need to make sure to download another c
to ensure the built-in calculations function pro

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_2)^2]^a[1+(f/f_2)^2]^b}\right\}$$

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Whittier Head of the Bay Cruise Ship Dock Project
PROJECT/SOURCE INFORMATION	Sound measurements from 36-inch piles at the Bangor, Washington waterfront project. Presented in Table 2-2 of Proxy Source Sound Levels and Potential Bubble Curtian Attentuation for Acoustic Modeling of Nearshore Marine Pile Driving at Navy Installations in Puget Sound (U.S. Navy 2015).

Please include any assumptions

PROJECT CONTACT	Carrie Connaker (carrie@solsticeak.com)

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)¥	2.5	default

¥Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	166
Number of piles within 24-h period	4
Duration to drive a single pile (minutes)	15
Duration of Sound Production within 24-h period (seconds)	3600
10 Log (duration of sound production)	35.56
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	10

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**14.7**	**1.3**	**21.8**	**8.9**	**0.6**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjus
they need to make sure to download another c
to ensure the built-in calculations function pro

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{\ldots}\right\}$$

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Whittier Head of the Bay Cruise Ship Dock Project
PROJECT/SOURCE INFORMATION	48-inch Vibratory Source:48-inch unattentuated vibratory hammer installation during Port of Anchorage Test Pile Program (Austin et al. 2016; Table 16)

Please include any assumptions

PROJECT CONTACT	Carrie Connaker (carrie@solsticeak.com)

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)¥	2.5	default

¥Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	168.2
Number of piles within 24-h period	2
Duration to drive a single pile (minutes)	15
Duration of Sound Production within 24-h period (seconds)	1800
10 Log (duration of sound production)	32.55
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	10

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**13.0**	**1.2**	**19.2**	**7.9**	**0.6**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjus
they need to make sure to download another c
to ensure the built-in calculations function pro

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Whittier Head of the Bay Cruise Ship Dock Project
PROJECT/SOURCE INFORMATION	36-inch Impact Source: average of unattentuated measurements from impact installation of 36-inch piles from three projects in Puget Sound presented in Proxy Source Sound Levels and Potential Bubble Curtain Attenuation for Acoustic

Please include any assumptions

PROJECT CONTACT	Carrie Connaker (carrie@solsticeak.com)

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)¥	2	default

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels are not available

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) PREFERRED METHOD (pulse duration not needed)

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**222.6**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B32)	184
Number of strikes per pile	1800
Number of piles per day	4
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	
$L_{p,0\text{-}pk}$ Source level	#NUM!

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**4,341.4**	**154.4**	**5,171.2**	**2,323.3**	**169.2**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Whittier Head of the Bay Cruise Ship Dock Project
PROJECT/SOURCE INFORMATION	48-inch Impact Source: 48-inch unattentuated impact hammer installation during Port of Anchorage Test Pile Program (Austin et al. 2016; Table 9)

Please include any assumptions

PROJECT CONTACT	Carrie Connaker (carrie@solsticeak.com)

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)¥	2	default

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels ar

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) PREFERRED METHOD (pulse duration not needed)

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**223.5**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,single\ strike}$) specified at "x" meters (Cell B32)	186.7
Number of strikes per pile	2400
Number of piles per day	2
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	212
Distance of $L_{p,0\text{-}pk}$ measurement (meters)†	10
$L_{p,0\text{-}pk}$ Source level	227.0

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**5,014.6**	**178.4**	**5,973.1**	**2,683.6**	**195.4**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**3.4**	**NA**	**46.4**	**4.0**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

E.2: DTH PILE DRIVING/INSTALLATION (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Whittier Head of the Bay Cruise Ship Dock Project
PROJECT/SOURCE INFORMATION	36-inch DTH Source: 42-inch DTH Proxy from Reyff & Heyvaert, 2019; Reyff, 2020; and Denes et al., 2019

Please include any assumptions

PROJECT CONTACT	Carrie Connaker (carrie@solsticeak.com)

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 50), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**215.6**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B30)	164
Strike rate (average strikes per second)	10
Duration to drive pile (minutes)	60
Number of piles per day	4
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10
Total number of strikes in a 24-h period	144000

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G26)	
Distance of $L_{p,0\text{-}pk}$ measurement (meters)+	
$L_{p,0\text{-}pk}$ Source level	#NUM!

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**1,484.7**	**52.8**	**1,768.5**	**794.6**	**57.9**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

NOTE: If user decided to override these they need to make sure to download ar to ensure the built-in calculations func

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.2: DTH PILE DRIVING/INSTALLATION (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Whittier Head of the Bay Cruise Ship Dock Project
PROJECT/SOURCE INFORMATION	36-inch DTH Source: 42-inch DTH Proxy from Reyff & Heyvaert, 2019; Reyff, 2020; and Denes et al., 2019

Please include any assumptions

PROJECT CONTACT	Carrie Connaker (carrie@solsticeak.com)

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 50), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**216.6**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B30)	164
Strike rate (average strikes per second)	10
Duration to drive pile (minutes)	150
Number of piles per day	2
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10
Total number of strikes in a 24-h period	180000

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G26)	
Distance of $L_{p,0\text{-}pk}$ measurement (meters)+	
$L_{p,0\text{-}pk}$ Source level	#NUM!

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**1,722.9**	**61.3**	**2,052.2**	**922.0**	**67.1**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

NOTE: If user decided to override these they need to make sure to download ar to ensure the built-in calculations func

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.2: DTH PILE DRIVING/INSTALLATION (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Whittier Head of the Bay Cruise Ship Dock Project
PROJECT/SOURCE INFORMATION	48-inch DTH Source: Logarithmic regression model from NMFS based on 42-inch DTH Proxy from Reyff & Heyvaert, 2019; Reyff, 2020; and Denes et al., 2019

Please include any assumptions

PROJECT CONTACT	Carrie Connaker (carrie@solsticeak.com)

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 50), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**223.6**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B30)	171
Strike rate (average strikes per second)	10
Duration to drive pile (minutes)	150
Number of piles per day	2
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10
Total number of strikes in a 24-h period	180000

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G26)	
Distance of $L_{p,0\text{-}pk}$ measurement (meters)+	
$L_{p,0\text{-}pk}$ Source level	#NUM!

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**5,045.7**	**179.5**	**6,010.2**	**2,700.2**	**196.6**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

NOTE: If user dec they need to mak to ensure the buil

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{\ldots}\right\}$$

Table 2—Summary of sound level, timing of sound production, distance from sound source to below Level A harassment and Level B harassment thresholds, days of impact, sea otters in Level A and Level B harassment ensonification area, and total otters expected to be harassed through behavioral disturbance by vibratory drilling.

Pile size	91-cm (36-in) (temporary)–installation	91-cm (36-in) (temporary)–removal	91-cm (36-in) (permanent)	122-cm (48-in)
Total number of piles	15	15	7	8
Sound level	166 dB re 1µPa at 10 m (RMS)			168.2 dB re 1µPa at 10 m (RMS)
Source	NAVFAC[a] 2015			Austin et al. 2016
Timing per pile	10 minutes/pile	10 minutes/pile	15 minutes/pile	15 minutes/pile
Maximum number of piles per day	4	4	4	2
Maximum number of days of activity	4	4	2	4
Sea otter density	2.03 sea otters/km^2			
Distance to below Level A harassment threshold	0.5 meters	0.5 meters	0.6 meters	0.6 meters
Level A area (km^2)	0.000001	0.000001	0.000001	0.000001
Potential sea otters affected by Level A sound per day	0.000002	0.000002	0.000002	0.000002
Potential sea otters affected by Level A sound per day (rounded)	0	0	0	0
Total potential Level A harassment events	0	0	0	0
Distance to below Level B harassment threshold	25 meters	25 meters	25 meters	35 meters
Level B area (km^2)	0.002	0.0020	0.0020	0.0038
Potential sea otters affected by Level B sound per day	0.0040	0.0040	0.004	0.0078
Potential sea otters affected by Level B sound per day (rounded)	0	0	0	0
Total potential Level B harassment events	0	0	0	0

Table 3—Summary of sound level, timing of sound production, distance from sound source to below Level A harassment and Level B harassment thresholds, days of impact, sea otters in Level A and Level B harassment ensonification area, and total otters expected to be harassed through behavioral disturbance by impact pile driving.

Pile size	91-cm (36-in) (permanent)	122-cm (48-in)
Total number of piles	7	8
Sound level	184 dB (SEL)/ 192 dB (RMS)/ 211 dB (peak) re 1µPa at 10	186.7 dB (SEL)/ 198.6 dB (RMS)/ 212 dB (peak) re 1µPa at 10 m
Source	NAVFAC 2015	Austin et al. 2016
Timing per pile	45 minutes/pile; 1,800 strikes/pile	60 minutes/pile; 2,400 strikes/pile
Maximum number piles per day	4	2
Maximum number of days of activity	2	4
Sea otter density	2.03 sea otters/km^2	
Distance to below Level A harassment threshold	169.2 meters	195.4 meters
Level A area (km^2)	0.0718	0.1199
Potential sea otters affected by Level A sound per day	0.1458	0.2435
Potential sea otters affected by Level A sound per day (rounded)	1	1
Total potential Level A harassment events	2	4
Distance to below Level B harassment threshold	1,359 meters	3,744 meters
Level B area (km^2)	1.9161	7.8846
Potential sea otters affected by Level B sound per day	3.8897	16.0058
Potential sea otters affected by Level B sound per day (rounded)	4	16
Total potential Level B harassment events	8	64

Table 4—Summary of sound level, timing of sound production, distance from sound source to below Level A harassment and Level B harassment thresholds, days of impact, sea otters in Level A and Level B harassment ensonification area, and total otters expected to be harassed through behavioral disturbance by down-the-hole drilling.

Pile size	91-cm (36-in) (temporary)	91-cm (36-in) (permanent)	122-cm (48-in)
Total number of piles	10 (installation only)	7	8
Sound level	164 dB (SEL)/ 167 dB (RMS) re 1µPa at 10 m		171 dB (SEL)/ 167 (RMS) dB re 1µPa at 10 m
Source	Reyff and Heyvaert 2019; Reyff 2020; Denes et al. 2019; Heyvaert and Reyff 2021		SolsticeAK 2022; Heyvaert and Reyff 2021
Timing per pile	60 minutes/pile	150 minutes/pile	150 minutes/pile
Maximum number piles per day	4	2	2
Maximum number of days of activity	3	4	4
Sea otter density	2.03 sea otters/km^2		
Distance to below Level A harassment threshold[a]	57.9 meters	67.1 meters	196.6 meters
Level A area (km^2)	0.0105	0.0141	0.1214
Potential sea otters affected by Level A sound per day	0.0214	0.0287	0.2465
Potential sea otters affected by Level A sound per day (rounded)	1	1	1
Total potential Level A harassment events	3	4	4
Distance to below Level B harassment threshold[a]	29 meters	29 meters	29 meters
Level B area (km^2)	0.0026	0.0026	0.0026
Potential sea otters affected by Level B sound per day	0.0054	0.0054	0.0054
Potential sea otters affected by Level B sound per day (rounded)	0	0	0
Total potential Level B harassment events	0	0	0

Table 5—Summary of sound level, timing of sound production, distance from sound source to below Level A harassment and Level B harassment thresholds, days of impact, sea otters in Level A and Level B harassment ensonification area, and total otters expected to be harassed through behavioral disturbance by use of skiffs.

Sound source	Monitoring skiff	Worker transit skiff
Sound level	175 dB (RMS) re 1µPa at 1 m	175 dB (RMS) re 1µPa at 1 m
Source	Richardson et al. 1995; Kipple and Gabriele 2007	
Number of days of vessel use	31	31
Sea otter density	2.03 sea otters/km^2	
Distance to below Level A harassment threshold	0 meters	0 meters
Level A area (km^2)	0	0
Potential sea otters affected by Level A sound per	0	0
Potential sea otters affected by Level A sound per day (rounded)	0	0
Total potential Level A harassment events	0	0
Distance to below Level B harassment threshold	10 meters	10 meters
Level B area (km^2)	0.2832	0.0095
Potential sea otters affected by Level B sound per day	0.5748	0.0192
Potential sea otters affected by Level B sound per day (rounded)	1	1
Total potential Level B harassment events	31	31

Table 6—Total estimated takes by source of Level A and Level B harassment of sea otters

Source		Number of days of activity	Sea otters exposed per day to Level A harassment	Total takes of sea otters by Level A harassment	Sea otters exposed per day to Level B harassment	Total takes of sea otters by Level B harassment
Vibratory drilling	91-cm (36-in) (temporary)–installation	4	0	0	0	0
	91-cm (36-in) (temporary)–removal	4	0	0	0	0
	91-cm (36-in) (permanent)	2	0	0	0	0
	122-cm (48-in)	4	0	0	0	0
Impact drilling	91-cm (36-in) (permanent)	2	1	2	4	8
	122-cm (48-in)	4	1	4	16	64
Down-the-hole drilling	91-cm (36-in) (temporary)–installation	3	1	3	0	0
	91-cm (36-in) (permanent)	4	1	4	0	0
	122-cm (48-in)	4	1	4	0	0
Skiff use	Monitoring skiff	31	0	0	1	31
	Worker transit skiff	31	0	0	1	31
Totals		93	5	17	22	134

[a] Due to differences in how PTS and TTS thresholds are calculated, the Level A isopleths are larger than the Level B isopleths.

	Vibratory			
Pile size	91-cm (36-in) (temporary) - installation	91-cm (36-in) (temporary) - removal	91-cm (36-in) (permanent)	122-cm (48-in)
Sea otter density	2.03 sea otters/km^2			
Distance to below Level A harassment threshold	0.5 meters	0.5 meters	0.6 meters	0.6 meters
Level A area (km^2)	0.000001	0.000001	0.000001	0.000001
Potential sea otters affected by Level A sound per day	0.000002	0.000002	0.000002	0.000002
Potential sea otters affected by Level A sound per day (rounded)	0	0	0	0
Total potential Level A harassment events	0	0	0	0
Distance to below Level B harassment threshold	25 meters	25 meters	25 meters	35 meters
Level B area (km^2)	0.002	0.0020	0.0020	0.0038
Potential sea otters affected by Level B sound per day	0.0040	0.0040	0.004	0.0078
Potential sea otters affected by Level B sound per day (rounded)	0	0	0	0
Total potential Level B harassment events	0	0	0	0

	36"/steel pile- vibratory	91-cm (36-in) (permanent)- vibratory	122-cm (48-in)- vibratory
The majority of these radii are small enough that their defined circles will fall entirely in the water, and in these instances, the area was calculated as πr^2.			
	0.7853975	1.1309724	1.1309724
	Level A area (square meters); $pi*r^2$; r = 0.5 m	Level A area (square meters); $pi*r^2$; r = 0.6 m	Level A area (square meters); $pi*r^2$; r = 0.6 m
	0.000001	0.000001	0.000001
	Convert to square km	Convert to square km	Convert to square km
	0.000002	0.000002	0.000002
	otters exposed; Multiply by sea otter density (2.03 otters/sq km)	otters exposed; Multiply by sea otter density (2.03 otters/sq km)	otters exposed; Multiply by sea otter density (2.03 otters/sq km)
	0	0	0
	rounded sea otters exposed	rounded sea otters exposed	rounded sea otters exposed
	0	0	0
	total sea otters exposed; multiply by number of days	total sea otters exposed; multiply by number of days	total sea otters exposed; multiply by number of days
	1963.49375	1963.49375	3848.44775
	Level B area (square meters); $pi*r^2$; r = 25 m	Level B area (square meters); $pi*r^2$; r = 25 m	Level B area (square meters); $pi*r^2$; r = 35 m
	0.0020	0.0020	0.0038
	Convert to square km	Convert to square km	Convert to square km
	0.0040	0.0040	0.0078
	otters exposed; Multiply by sea otter density (2.03 otters/sq km)	otters exposed; Multiply by sea otter density (2.03 otters/sq km)	otters exposed; Multiply by sea otter density (2.03 otters/sq km)
	0	0	0
	rounded sea otters exposed	rounded sea otters exposed	rounded sea otters exposed
	0	0	0
	total sea otters exposed; multiply by number of days	total sea otters exposed; multiply by number of days	total sea otters exposed; multiply by number of days

	Impact	
Pile size	91-cm (36-in) (permanent)	122-cm (48-in)
Sea otter density	2.03 sea otters/km^2	
Distance to below Level A harassment threshold	169.2 meters	195.4 meters
Level A area (km^2)	0.0718	0.1199
Potential sea otters affected by Level A sound per day	0.1458	0.2435
Potential sea otters affected by Level A sound per day (rounded)	1	1
Total potential Level A harassment events	2	4
Distance to below Level B harassment threshold	1,359 meters	3,744 meters
Level B area (km^2)	1.9161	7.8946
Potential sea otters affected by Level B sound per day	3.8897	16.0058
Potential sea otters affected by Level B sound per day (rounded)	4	16
Total potential Level B harassment events	8	64

	91-cm (36-in)- permanent- impact	122-cm (48-in)- impact
The majority of these radii are small enough that their defined circles will fall entirely in the water, and in these instances, the area was calculated as $\pi r2$. The exceptions are the Level A and Level B zones generated by impact pile driving the 36-in-permanent piles, as well as the Level B zone generated by impact pile driving the 48-in piles.		
	71830.52801	119940.5504
	Area (m) determined by ArcGIS Pro analysis	Level A area (square meters); $pi*r^2$; r = 195.4 m
	0.0718	0.1199
	Convert to square km	Convert to square km
	0.1458	0.2435
	otters exposed; Multiply by sea otter density (2.03 otters/sq km)	otters exposed; Multiply by sea otter density (2.03 otters/sq km)
	1	1
	rounded sea otters exposed	rounded sea otters exposed
	2	4
	total sea otters exposed; multiply by number of days	total sea otters exposed; multiply by number of days
	1918095.976	7884645.417
	Area (m) determined by ArcGIS Pro analysis	Area (m) determined by ArcGIS Pro analysis
	1.9161	7.8946
	Convert to square km	Convert to square km
	3.8897	16.0058
	otters exposed; Multiply by sea otter density (2.03 otters/sq km)	otters exposed; Multiply by sea otter density (2.03 otters/sq km)
	4	16
	rounded sea otters exposed	rounded sea otters exposed
	8	64
	total sea otters exposed; multiply by number of days	total sea otters exposed; multiply by number of days

	DTH		
Pile size	91-cm (36-in) (temporary)	91-cm (36-in) (permanent)	122-cm (48-in)
Sea otter density	2.03 sea otters/km^2		
Distance to below Level A harassment threshold	57.9 meters	67.1 meters	196.6 meters
Level A area (km^2)	0.0105	0.0141	0.1214
Potential sea otters affected by Level A sound per day	0.0214	0.0287	0.2465
Potential sea otters affected by Level A sound per day (rounded)	1	1	1
Total potential Level A harassment events	3	4	4
Distance to below Level B harassment threshold	29 meters	29 meters	29 meters
Level B area (km^2)	0.0026	0.0026	0.0026
Potential sea otters affected by Level B sound per day	0.0054	0.0054	0.0054
Potential sea otters affected by Level B sound per day (rounded)	0	0	0
Total potential Level B harassment events	0	0	0

	36"/steam pile- DTH	91-cm (36-in)-(permanent)- DTH	122-cm (48-in)- DTH
The majority of these radii are small enough that their defined circles will fall entirely in the water, and in these instances, the area was calculated as πr^2			
	10551.89773	14144.726	1214273.5944
	Level A area (square meters); $pi*r^2$; r = 57.9 m	Level A area (square meters); $pi*r^2$; r = 67.1 m	Level A area (square meters); $pi*r^2$; r = 196.6 m
	0.0105	0.0141	0.1214
	Convert to square km	Convert to square km	Convert to square km
	0.0214	0.0287	0.2465
	otters exposed; Multiply by sea otter density (2.03 otters/sq km)	otters exposed; Multiply by sea otter density (2.03 otters/sq km)	otters exposed; Multiply by sea otter density (2.03 otters/sq km)
	1	1	1
	rounded sea otters exposed	rounded sea otters exposed	rounded sea otters exposed
	3	4	4
	total sea otters exposed; multiply by number of days	total sea otters exposed; multiply by number of days	total sea otters exposed; multiply by number of days
	2642.07719	2642.0772	2642.07719
	Level B area (square meters); $pi*r^2$; r = 29 m	Level B area (square meters); $pi*r^2$; r = 29 m	Level B area (square meters); $pi*r^2$; r = 29 m
	0.0026	0.0026	0.0026
	Convert to square km	Convert to square km	Convert to square km
	0.0054	0.0054	0.0054
	otters exposed; Multiply by sea otter density (2.03 otters/sq km)	otters exposed; Multiply by sea otter density (2.03 otters/sq km)	otters exposed; Multiply by sea otter density (2.03 otters/sq km)
	0	0	0
	rounded sea otters exposed	rounded sea otters exposed	rounded sea otters exposed
	0	0	0
	total sea otters exposed; multiply by number of days	total sea otters exposed; multiply by number of days	total sea otters exposed; multiply by number of days

	Shifts	
Sound source	Monitoring skiff	Worker transit skiff
Sea otter density	2.03 sea otters/km^2	
Distance to below Level A harassment threshold	0 meters	9 meters
Level A area (km^2)	0	0
Potential sea otters affected by Level A sound per day	0	0
Potential sea otters affected by Level A sound per day (rounded)	0	0
Total potential Level A harassment events	0	0
Distance to below Level B harassment threshold	10 meters	10 meters
Level B area (km^2)	0.2812	0.0095
Potential sea otters affected by Level B sound per day	0.5748	0.0192
Potential sea otters affected by Level B sound per day (rounded)	1	1
Total potential Level B harassment events	31	31

	Monitoring skiff area
	The monitoring skiff will travel in a triangle of perimeter approximately 7 km (4.3 mi) between Emerald Island,
283152.25	Area (m) determined by ArcGIS Pro analysis
0.2831523	Convert to square km
0.5747991	otters exposed; Multiply by sea otter density (2.03 otters/sq km)
1	rounded sea otters exposed
31	total sea otters exposed; multiply by number of days

	Worker Transit skiff area
	The area encircled by the worker transit skiff was estimated by multiplying the vessel's anticipated
9144	square meters; Daily track (457.2 m) * twice the 160 dB radius (10 m)
314.159	square meters; $pi*r^2$ (r = 10 m)
9458.159	Sum (square meters)
0.0094582	Convert to square km
0.0192001	otters exposed; Multiply by sea otter density (2.03 otters/sq km)
1	rounded sea otters exposed
31	total sea otters exposed; multiply by number of

APPENDIX C

MARINE MAMMAL MONITORING AND MITIGATION PLAN (4MP)

Marine Mammal Monitoring and Mitigation Plan

Turnagain Marine Construction
Whittier Head of the Bay Cruise Ship Dock

Passage Canal, Whittier, Alaska

February 2024

Prepared for:
Turnagain Marine Construction
8241 Dimond Hook Drive
Anchorage, Alaska 99507

Prepared by:

2607 Fairbanks Street Suite B
Anchorage, Alaska 99503

Submitted to:
U.S. Fish and Wildlife Service

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ACRONYMS AND ABBREVIATIONS

4MP	Marine Mammal Monitoring and Mitigation Plan
BA	Biological Assessment
DPS	distinct population segment
ESA	Endangered Species Act
IHA	Incidental Harassment Authorization
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
NMFS AKR	National Marine Fisheries Service Alaska Region
OPR	Office of Protected Resources (NMFS)
OSI	Offshore Systems, Inc.
PSO	protected species observer
rms	root mean square
SPL	sound pressure level
USACE	U.S. Army Corp of Engineers
USFWS	U.S. Fish and Wildlife Service
WDPS	western distinct population segment

INTRODUCTION

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

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

- U.S. Army Corps of Engineers (USACE), Passage Canal for activities in Waters of the U.S. (POA-2022-00233; issued 3/31/23)
- NMFS Office of Protected Resources (OPR) IHA (issued 4/1/23)
- NMFS Alaska Region, ESA Section 7(a)(2) Biological Opinion (AKRO-2022-02953; issued 3/28/23)
- USFWS Marine Mammal Management IHA (requested)

PROJECT DESCRIPTION

Under contract with Huna Totem Corporation, Turnagain Marine Construction (TMC) is constructing a cruise ship berth and associated facilities on the western shore of Passage Canal, approximately 1.2 kilometers (km) northwest of downtown Whittier, Alaska (Figure 1).

The completed cruise ship berth will consist of a 500-foot by 70-foot floating dock structure supported by 2 float restraints on either end and 2 mooring dolphins in marine waters that support several marine mammal species. Pile driving may result in auditory injury (Level A harassment) and behavioral harassment (Level B harassment) of select marine mammal species. Construction began in May 2023 and is anticipated to continue through August 2024. After July 2023, remaining pile installation activities are expected to occur for a total of approximately 70 hours over 30 days (not necessarily consecutive days). The project would occur within waters of the United States. No blasting is proposed as part of this project. Table 1 provides a more detailed overview of the project components.

Figure 1. Whittier Head of the Bay Cruise Ship Dock Project Location and Action Area

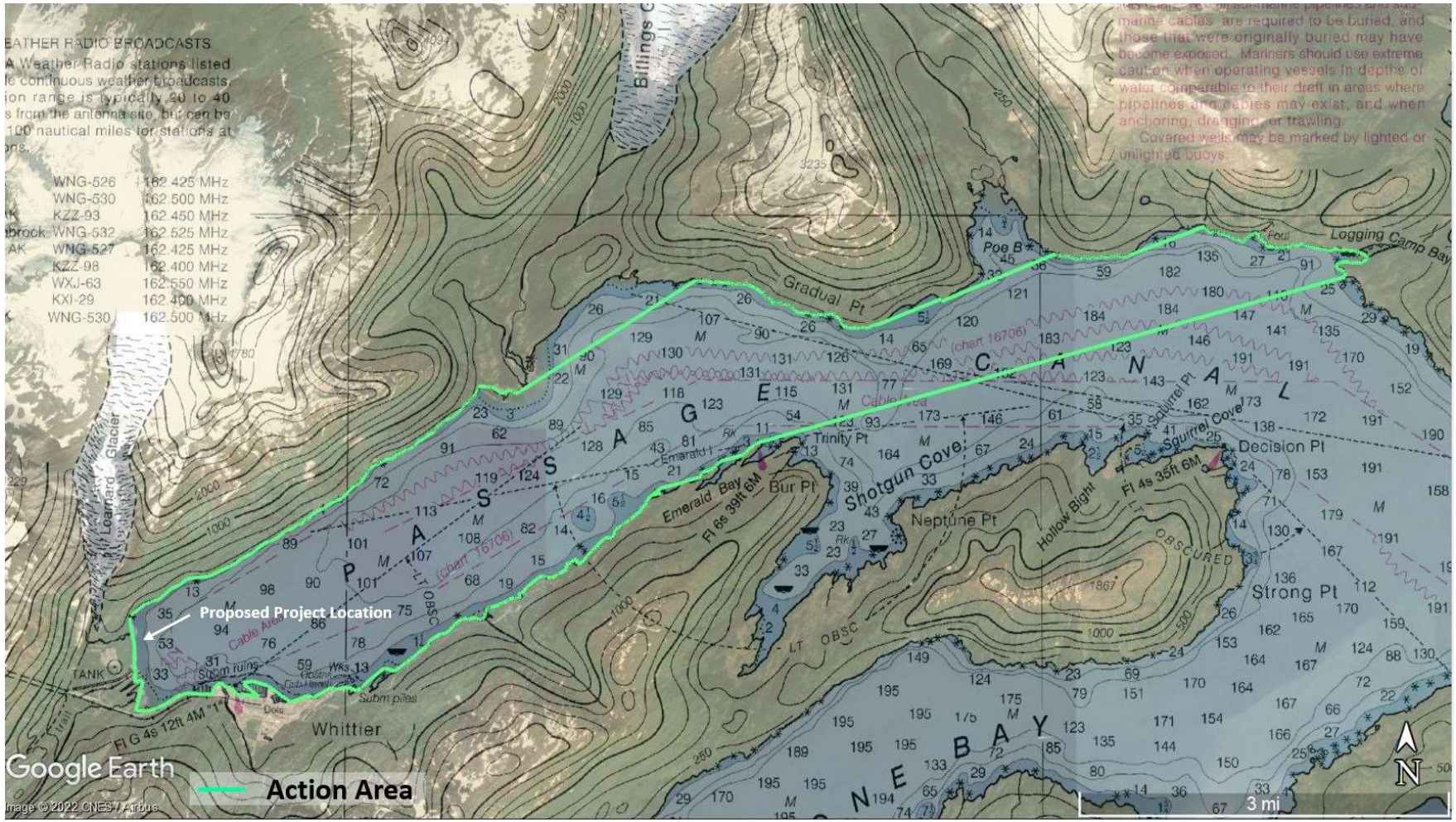


Table 1. Whittier Head of the Bay Cruise Ship Dock Project Pile Size, Quantity, and Installation Method

	Temp Pile Installation	Temp Pile Removal	36-Inch Perm Pile Installation	48-Inch Perm Pile Installation	Totals
# of Piles	15	15	7	8	
Diameter of Steel Pile (inches)	36	36	36	48	
Vibratory Pile Driving					
Total Quantity	15	15	7	8	
Max # Piles Vibrated per Day	4	4	4	2	
Vibratory Time per Pile (minutes)	10	10	15	15	
Vibratory Time per Day (minutes)	40	40	60	30	
# of Days	3.75	3.75	1.75	4	13.25
Vibratory Time Total (hours)	2.5	2.5	1.75	2	9
Impact Pile Driving					
Total Quantity	0	0	7	8	
Max # Piles Impacted Per Day	0	0	4	2	
# of Strikes per Pile	0	0	1,800	2,400	
Impact Time per Pile (minutes)	0	0	45	60	
Impact Time per Day (minutes)	0	0	180	120	
# of Days	0	0	1.75	4	5.8
Impact Time Total (hours)	0	0	5.25	8	13.25
Down-the-Hole Drilling					
Total Quantity	10	0	7	8	
Max # Piles Installed Per Day	4	0	2	2	
Time per Pile (minutes)	60	0	150	150	
Time per Day (minutes)	240	0	300	300	
# of Days	2.5	0	3.5	4	10
DTH Drilling Time Total (hours)	10	0	17.5	20	47.5

SPECIES COVERED UNDER THE IHA

There are 13 species under NMFS jurisdiction and 1 species under USFWS jurisdiction that have ranges that extend into the project area. Take has been requested for the species known to frequent the area, broken down by stock or distinct population segment (DPS; Table 2).

The shutdown of work following Level B thresholds will occur if any other marine mammal or avian species enters the project action area (Table 3). Other species that may occur are listed in Appendix A.

Table 2. Species Known to Occur in Whittier Head of the Bay Cruise Ship Dock Project Area and Requested Take Types and Numbers (may be updated following issuance of IHAs)

Species	Stock/DPS	Level A	Level B
Humpback Whale (*Megaptera novaeangliae*)	Hawaii DPS	0	22
	Western North Pacific DPS	0	1
	Mexico DPS	0	2
Dall's Porpoise (*Phocoenoides dalli*)	Alaska	9	36
Killer Whale (*Orcinus orca*)	Alaska Resident	0	116
	Gulf of Alaska Transient	0	29
	AT1 Transient	0	0
Harbor Seal (*Phoca vitulina*)	Prince William Sound	40	170
Steller Sea Lion (*Eumetopias jubatus*)	Western DPS (WDPS)	0	218
Northern Sea Otter (*Enhydra lutris kenyoni*)	Southcentral Alaska	17	134

MONITORING AND SHUTDOWN ZONES

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

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

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

Because species are impacted differently by noise, species-specific monitoring and shutdown zones have been calculated for this project. These monitoring and shutdown zones are shown in Table 3.

Monitoring Zones

Level B monitoring zones have been determined based on in-water activity type. For NMFS species, Level B monitoring zones represent areas where the sound pressure levels (SPLs) generated from pile driving activities meet or exceed 120 dB root mean square (rms) during vibratory pile driving and 160 dB rms during impact pile driving. Level B monitoring zones for USFWS species apply to northern sea otters and were established using the USFWS *Observer Protocols for Pile Driving, Dredging, ad Placement of Fill* and the distance at which SPLs meet or exceed 160 dB rms.

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

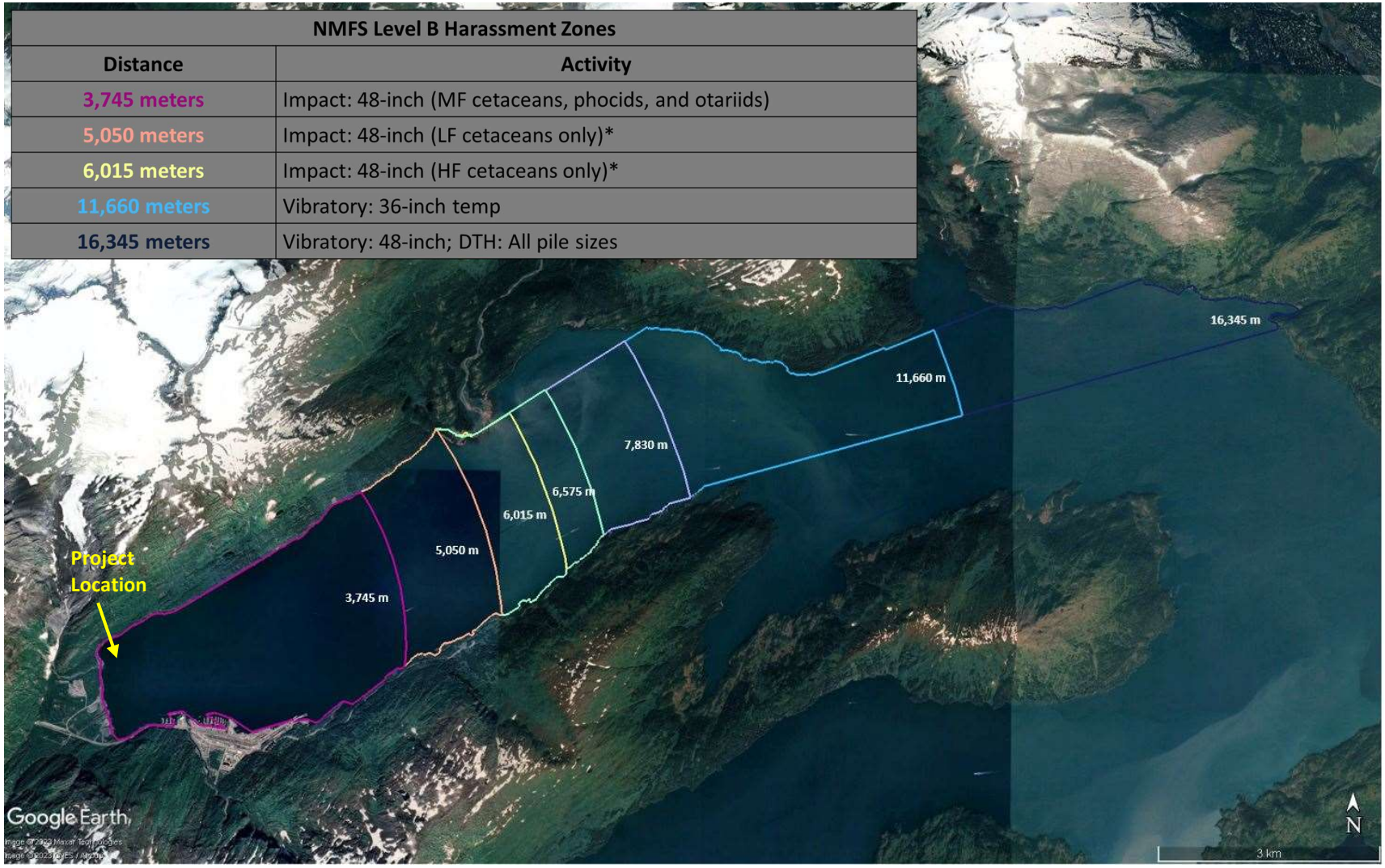
Level B monitoring/shutdown zones are presented in Table 3 and Figures 2 and 3 below.

Table 3. Whittier Head of the Bay Cruise Ship Dock Project Level B Monitoring and Shutdown Zones [a]

Source	Humpback Whales	Dall's Porpoises	Harbor Seals	Other NMFS-Jurisdiction Species	Northern Sea Otters
In-Water Construction Activities					
Barge movements, pile positioning, etc.[b]	10	10	10	10	10
Vibratory Pile Driving/Removal					
36-inch temporary pile installation	11,660	11,660	11,660	11,660	25
36-inch temporary pile removal	11,660	11,660	11,660	11,660	25
48-inch steel permanent installation	16,345	16,345	16,345	16,345	35
In-air[c] (all pile sizes)	N/A	N/A	70	70	25
Impact Pile Driving					
48-inch steel permanent installation	5,015[d]	5,975[d]	3,745	3,745	3,745
In-air[c] (all pile sizes)	N/A	N/A	55	55	25
DTH Drilling					
36-inch temporary pile installation	16,345	16,345	16,345	16,345	70[d]
48-inch steel permanent installation	16,345	16,345	16,345	16,345	200[d]

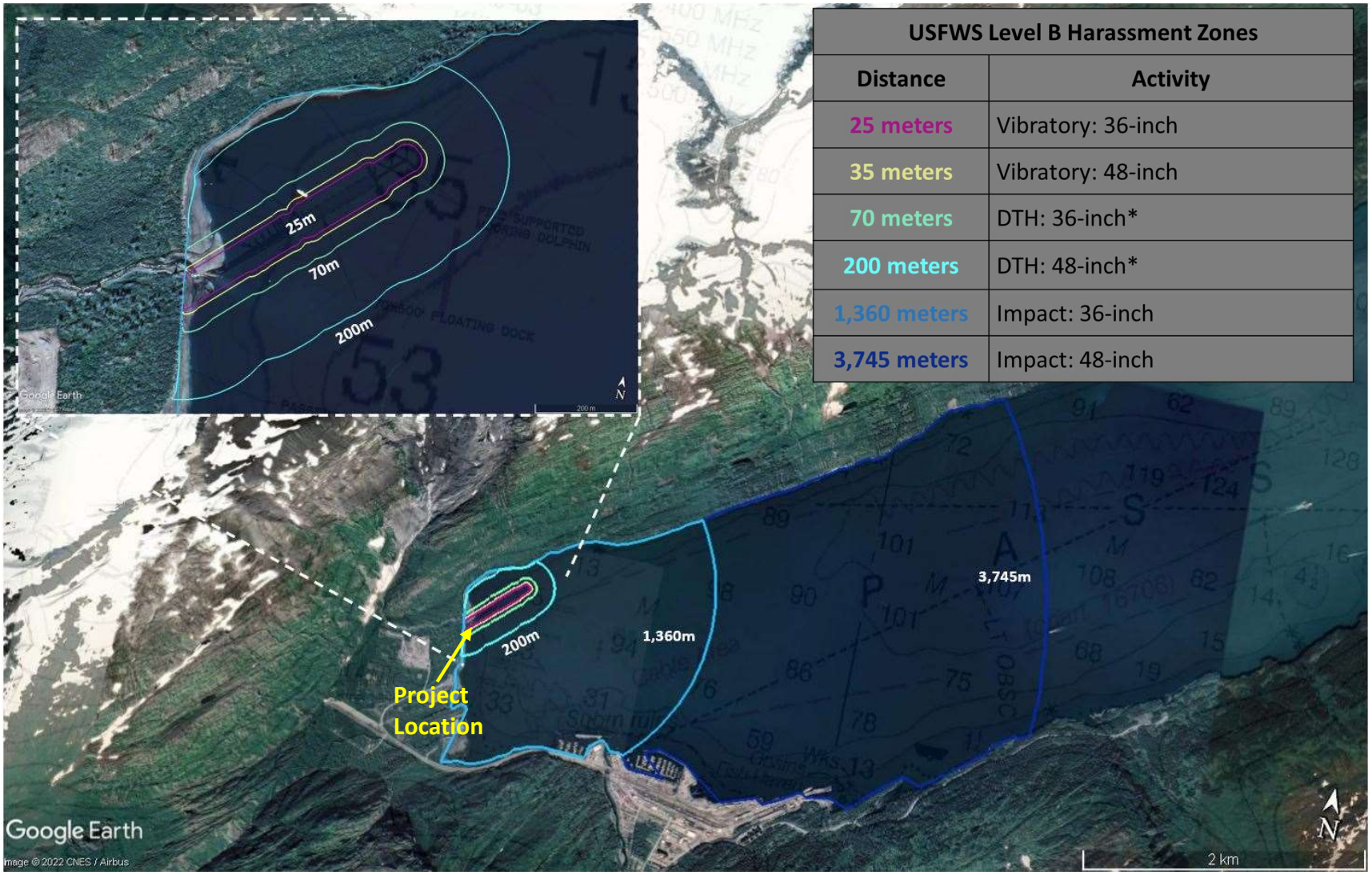
[a] Distances, in meters, apply to all marine mammal and avian species under NMFS and USFWS jurisdiction. The distances will act as a monitoring zone for species with authorized Level B take and as shutdown distances for species without authorized take, or in the case of humpback whales, during impact pile driving (see note d).
[b] Although acoustic injury is not the primary concern with these activities, shutdowns will be implemented to avoid impacts to species.
[c] In-air distances apply to marine mammals that spend significant amounts of time hauled out (Steller sea lions and harbor seals) or at the water surface (northern sea otters).
[d] For certain species and certain pile driving activities, the Level A shutdown zones are larger than the Level B monitoring zones due to differences in calculation methods used by NMFS. Therefore, the Level B monitoring zones shown here represent the Level A shutdown zone for this activity.

Figure 2. Whittier Head of the Bay Cruise Ship Dock Project Level B Monitoring Zones



*Indicates Level A zone. Where Level A zone radii are larger than the corresponding Level B radii, the Level A zone is shown.
MF = mid-frequency; LF = low-frequency; HF = high-frequency

Figure 3. Whittier Head of the Bay Cruise Ship Dock Project Northern Sea Otters Monitoring Zones



USFWS Level B Harassment Zones	
Distance	**Activity**
25 meters	Vibratory: 36-inch
35 meters	Vibratory: 48-inch
70 meters	DTH: 36-inch*
200 meters	DTH: 48-inch*
1,360 meters	Impact: 36-inch
3,745 meters	Impact: 48-inch

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

Shutdown Zones

Shutdown zones are defined as areas where SPLs meet or exceed the level that would cause auditory injury to marine mammals and avian species. Shutdown zones are intended to protect marine mammals and avian species from auditory injury. In-water activities would be halted upon the sighting of a marine mammal or avian species that is in (or anticipated to enter) the shutdown zone.

Further, there will be a nominal 10-meter shutdown zone for construction activity where acoustic injury is not the primary concern. This type of work could include (but is not limited to) the following activities: movement of the barge to the pile location; positioning of the pile on the substrate via a crane (i.e., stabbing the pile); and removal of the pile from the water column/substrate via a crane (i.e., deadpull). For these activities, monitoring would take place starting 15 minutes before initiation and ending when the action is complete. This can be monitored by the vessel operator when a PSO is not present. Radial distances to Level A shutdown zone boundaries are defined in Table 4 and shown in Figures 4 and 5.

Table 4. Whittier Head of the Bay Cruise Ship Dock Project Distances to Level A Shutdown Zones

Activity	Distance (in meters, m) to Level A					
	Low-Frequency (LF) Cetaceans	Mid-Frequency (MF) Cetaceans	High-Frequency (HF) Cetaceans	Phocid	Otariid	Northern Sea Otters
In-Water Construction Activities						
Barge movements, pile positioning, etc.[a] (throughout construction)	10	10	10	10	10	10
Vibratory Pile Driving/Removal						
36-inch temporary pile installation	35	35	35	15	15	15
36-inch temporary pile removal	35	35	35	15	15	15
48-inch steel permanent installation	35	35	35	15	15	15
Impact Pile Driving						
36-inch steel permanent installation	2,055	2,400[b]	2,400	1,100	80	170
48-inch steel permanent installation	5,050	6,015[b]	6,015	1,360[c]	200	200
DTH Drilling						
36-inch temporary pile installation	1,485	70	1,770	795	70	70
48-inch steel permanent installation	5,050	200	6,015	1,360[1]	200	200

Shutdown zone distances refer to the maximum radius of the zone and are rounded.

[a] Although acoustic injury is not the primary concern with these activities, shutdowns will be implemented to avoid impacts to species. Due to the scale of the figures, this zone is not shown on every figure.

[b] TMC has elected to conservatively apply thresholds for HF cetaceans to killer whales for impact pile driving. This species is an infrequent visitor to Passage Canal and is often highly visible, allowing for easier application of more conservative shutdown zones. This measure will reduce potential impacts to the highly vulnerable AT-1 killer whale stock that is found in this region should they enter the Passage Canal during the in-water work period.

[c] For phocids (harbor seals) only, the Level A shutdown zone would be reduced to 1,360 m for impact pile driving of 42- and 48-inch piles and DTH drilling of 48-inch piles to exclude the Whittier Public Boat Harbor.

Figure 4. Whittier Head of the Bay Cruise Ship Dock Project Level A Shutdown Zones

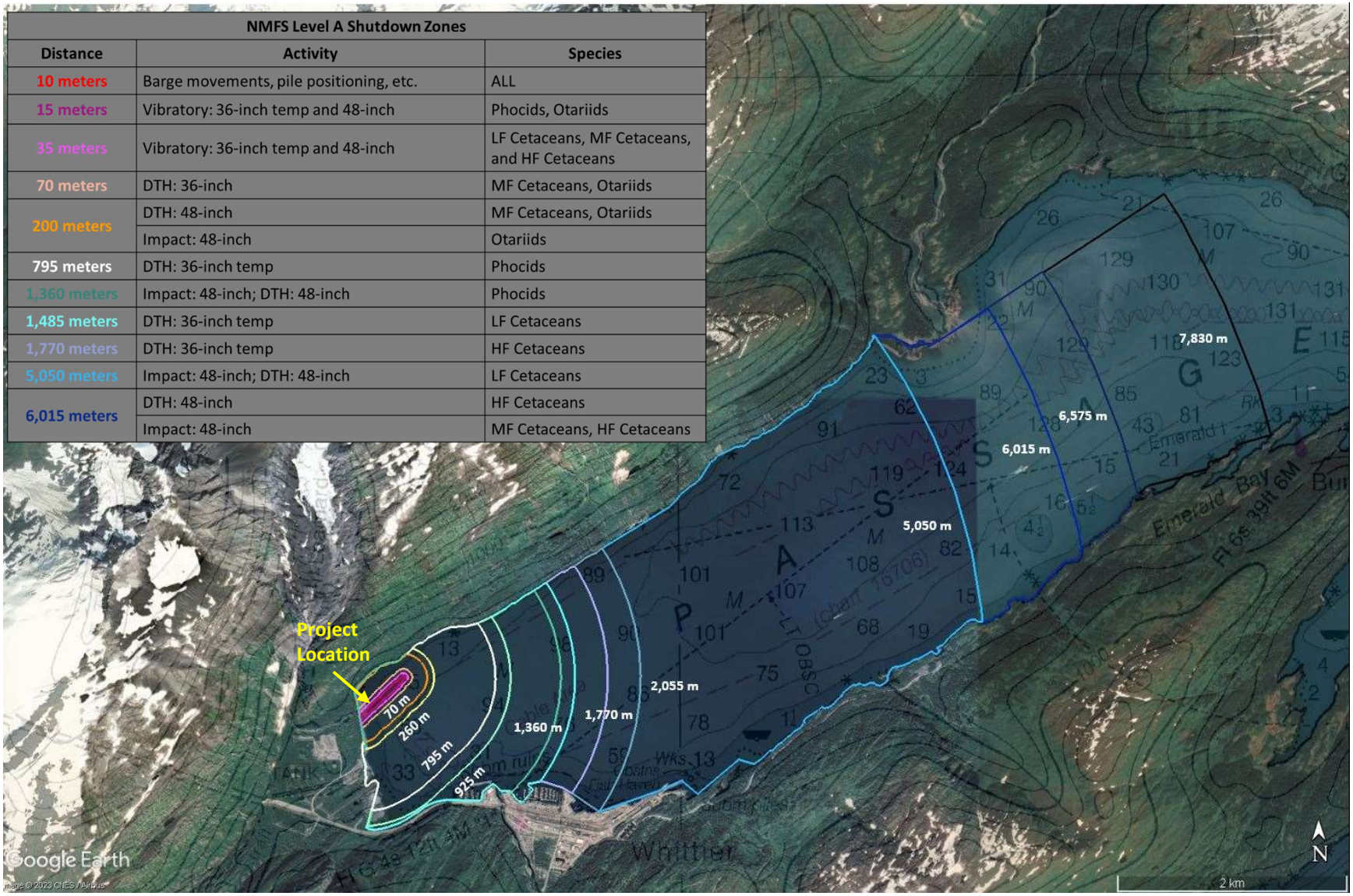
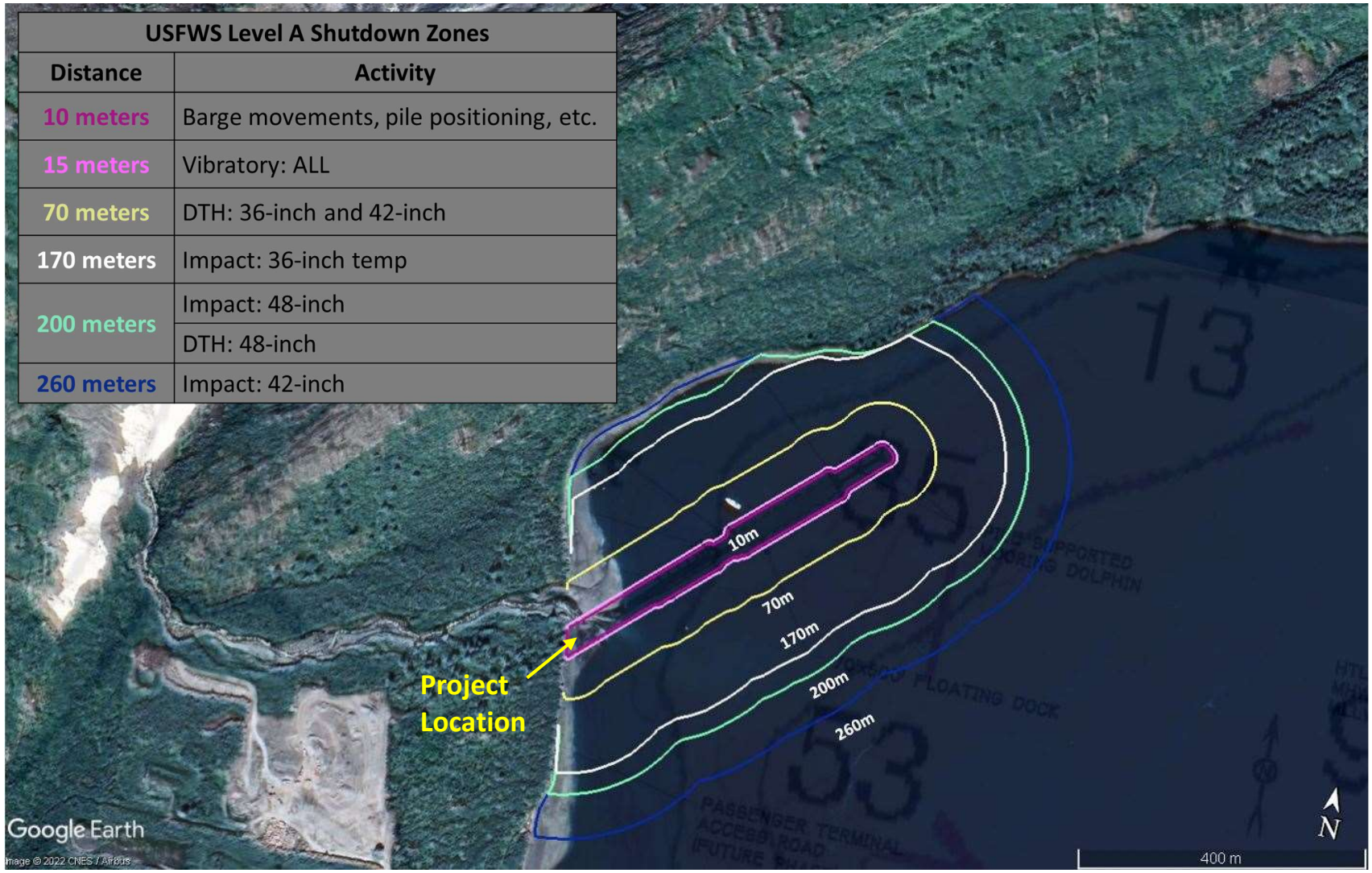


Figure 5. Whittier Head of the Bay Cruise Ship Dock Project Level A Shutdown Zones for Northern Sea Otter



MITIGATION MEASURES

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

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

General Conditions and Requirements

- Turnagain will employ a 60-foot-deep bubble curtain during installation (all pile driving methods) of piles occurring at the 60-foot isobath or shallower. This includes all temporary and permanent piles to support the approach trestle (Area 1). Through consultation and coordination with NMFS, a 5 dB reduction would be applied to the estimated sound source levels for driving these piles only with a subsequent reduction in Level B monitoring zones and Level A shutdown zones.
- Turnagain will attempt to minimize the use of an impact hammer to the extent possible by utilizing a vibratory hammer to advance the piling as deep as possible prior to switching to impact driving.
- Turnagain will also employ pile caps and the 60-foot-deep bubble curtain during impact pile driving to reduce noise impacts. Sound source levels used in the application to estimate sound isopleths and action areas were not reduced due to use of either the pile caps or bubble curtain when depths were greater than 60 feet.
- Pile caps (pile softening material) will be used to minimize noise during impact pile driving. Much of the noise generated during pile installation comes from contact between the pile and the steel template used to stabilize the pile. The contractor will use high-density polyethylene or ultra-high-molecular-weight polyethylene softening material on all templates to eliminate steel-on-steel noise.
- The contractor is required to conduct briefings for construction supervisors and crews and the monitoring team prior to the start of all pile driving activity, and upon hiring new personnel, to explain responsibilities, communication procedures, the marine mammal monitoring protocol, and operational procedures.
- The contractor is required to employ PSOs during all in-water construction activities.
- Marine mammal monitoring must take place starting 30 minutes prior to initiation of in-water work and ending 30 minutes after completion of in-water work. In-water work may commence when observers have declared the appropriate zones clear of marine mammals or avian species. In the event of a delay or shutdown of activity resulting from marine mammals or avian species in the shutdown zone (Table 4), their behavior must be monitored and documented until they leave of their own volition, at which point the activity may begin or resume.

- In-water work must be halted or delayed if a marine mammal or avian species is observed entering or within an established shutdown zone (Table 4). Pile driving may not commence or resume until either: the animal has voluntarily left and has been visually confirmed beyond the shutdown zone; 15 minutes have passed without subsequent observations of small cetaceans and pinnipeds; or 30 minutes have passed without subsequent observations of large cetaceans or sea otter.
- The contractor must use soft start techniques when impact pile driving.
- In-water work must be delayed or halted immediately if a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized takes are met, is observed approaching or within the monitoring zone (Table 3). Activities must not start or resume until the animal has been confirmed to have left the area or the observation time period, as indicated in the conditions above, has elapsed.
- In-water work would only occur during daylight hours.
- Should light or environmental conditions deteriorate such that marine mammals within the entire largest Level A shutdown zone would not be visible (e.g., fog, heavy rain), pile driving and removal must be delayed until the PSOs are confident marine mammals or avian species within the shutdown zone could be detected.
- PSOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break between shifts, and will not perform PSO duties for more than 12 hours in a 24-hour period (to reduce PSO fatigue).

Observer Qualifications and Requirements

- Visual acuity in both eyes (correction is permissible) sufficient to discern moving targets at the water's surface and ability to estimate target size and distance. Use of binoculars and/or spotting scope may be necessary to correctly identify the target.
- Advanced education in biological science, wildlife management, mammalogy or related fields (Bachelor's degree or higher is preferred), or equivalent Alaska Native traditional knowledge. PSOs may substitute education or training for experience.
- Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience).
- Experience or training in field identification of marine mammals (cetaceans and pinnipeds).
- Training, knowledge of or experience with vessel operation and pile driving operations sufficient to provide personal safety during observations.
- Writing skills sufficient to prepare a report of observations. Reports should include: the number, type, and location of marine mammals observed; the behavior of marine mammals in the area of potential sound effects during construction; dates and times when observations and in-water construction activities were conducted; dates and

times when in-water construction activities were suspended because of marine mammals; etc.
- Ability to communicate orally as needed, by radio or in person, with project personnel to provide real time information about marine mammals observed in the area.
- PSOs must be independent (*i.e.*, not construction personnel) and have no other assigned tasks during monitoring periods.
- A lead observer or monitoring coordinator must be designated if a team of three or more PSOs are required. The lead observer must have prior experience working as a marine mammal observer during construction.
- The contractor must submit PSO CVs for approval by NMFS and USFWS prior to the onset of pile driving.

Data Collection

Environmental Conditions and Construction Activities

PSOs will use the environmental conditions and construction activities log to document the following (Appendix B):

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

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

Sightings

Observers will use an approved marine mammal sighting form and GPS grid maps (Appendices C and D) which will be completed by each observer for each survey day and location. Sighting forms will be used by observers to record the following:

- Date and time that permitted construction activity begins or ends;

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

The observation record forms will be checked for quality assurance and quality control (QA/QC) by the lead PSO for submission at the end of every monitoring day. Upon request, the data will be submitted to NMFS and USFWS along with the final report.

Equipment

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

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

Number and Location of PSOs

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

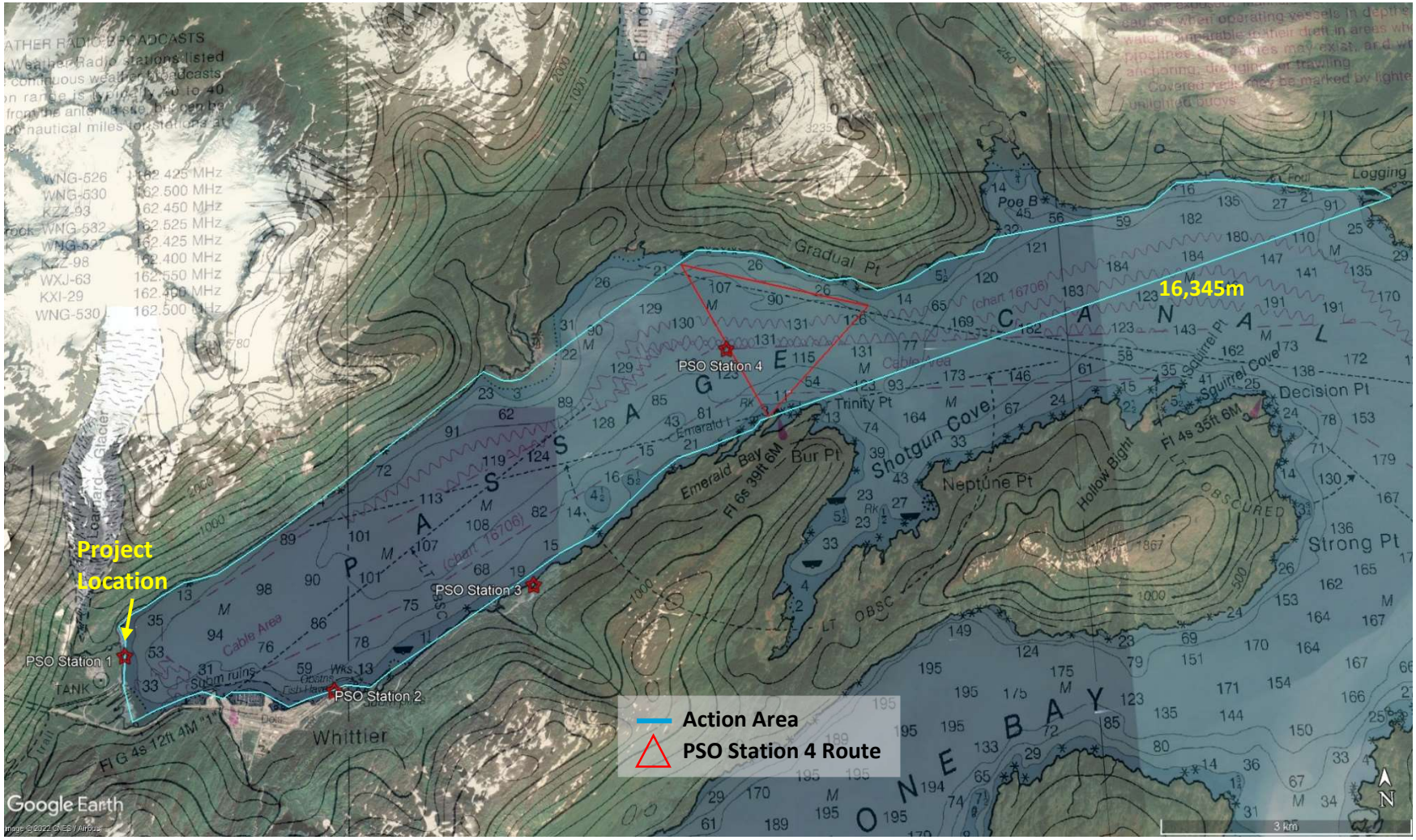
One to four PSOs will be onsite during in-water activities associated with the Whittier Head of the Bay Cruise Ship Dock Project, stationed in the following locations (Figure 6):

- Station 1: stationed just to the south of the site on the shore.
- Station 2: stationed off Depot Road near the freight loading dock.
- Station 3: stationed along the shoreline northeast of the Emerald Cove Trailhead.
- Station 4: stationed on a boat triangulating an area between Emerald Island, the north shore of Passage Canal, southeast towards Gradual Point, and back southwest towards Trinity Point and Emerald Island.

The number and locations of monitors will be based on the following in-water work scenarios:

- Scenario #1: In-water construction not involving pile driving; barge movements, etc.
    - One location: Station 1
- Scenario #3: Impact hammer, vibratory hammer, and DTH drill installation of all pile sizes
    - Four Locations: Stations 1 – 4

Figure 6. Whittier Head of the Bay Cruise Ship Dock Project PSO Locations



Strike Avoidance

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

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

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

Monitoring Techniques

Pre-Activity Monitoring

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

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

Soft Start Procedures

Soft start procedures will be used prior to periods of impact driving to allow marine mammals to leave the area prior to exposure to maximum noise levels. Soft start procedures for vibratory pile driving will not be implemented and are not required.

- The contractor will initiate approximately three strikes at a reduced energy level, followed by a 30-second waiting period. This procedure would be repeated twice more.
- If work ceases for more than 30 minutes, soft start procedures must be used prior to continuing work.

During Activity Monitoring

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

Inclement Weather

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

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

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

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

Shutdowns

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

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

observation of the animal. Observers will contact the pile driving supervisor and inform them that activities can re-commence.

Breaks in Work

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

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

Post Activity Monitoring

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

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

REPORTING

Notification of Intent to Commence Construction

The contractor will inform NMFS OPR, NMFS Alaska Region Protected Resources Division, and USFWS one week prior to commencing construction activities.

Weekly Sighting Counts

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

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

Interim Monthly Reports

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

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

Final Report

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

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

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

Reporting Injured or Dead Marine Mammals

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

The report must include the following:

- Time and date of the incident
- Description of the incident
- Environmental conditions (e.g., wind speed and direction, Beaufort Sea state, cloud cover and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;

- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and;
- Photographs or video footage of the animal(s) (if available).

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

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

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

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

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

Species and their Status Listed by the NMFS Mapper and USFWS IPaC Mapper that May Occur in the Project Vicinity

Species	Status Listing	Jurisdiction	Occurrence	Link to Species Profile
Gray Whale (*Eschrichtius robustus*)	MMPA	NMFS	Very rare	https://www.fisheries.noaa.gov/species/gray-whale
North Pacific Right Whale (*Eubalaena japonica*)	ESA Endangered	NMFS	Very rare	https://www.fisheries.noaa.gov/species/north-pacific-right-whale
Minke Whale (*Balaenoptera acutorostrata*)	MMPA	NMFS	Very rare	https://www.fisheries.noaa.gov/species/minke-whale
Fin Whale (*Balaenoptera physalus*)	ESA Endangered	NMFS	Very rare	https://www.fisheries.noaa.gov/search?oq=fin+whale
Humpback Whale (*Megaptera novaeangliae*)	Western North Pacific DPS: ESA Endangered; Mexico DPS: Threatened	NMFS	Infrequent	https://www.fisheries.noaa.gov/species/humpback-whale
Sperm Whale (*Physeter macrocephalus*)	ESA Endangered	NMFS	Very rare	https://www.fisheries.noaa.gov/species/sperm-whale
Dall's Porpoise (*Phocoenoides dalli*)	MMPA	NMFS	Infrequent	https://www.fisheries.noaa.gov/species/dalls-porpoise
Harbor Porpoise (*Phocoena phocoena*)	MMPA	NMFS	Very rare	https://www.fisheries.noaa.gov/species/harbor-porpoise
Pacific White-Sided Dolphin (*Lagenorhynchus obliquidens*)	MMPA	NMFS	Very rare	https://www.fisheries.noaa.gov/species/pacific-white-sided-dolphin
Killer Whale (*Orcinus orca*)	MMPA	NMFS	Infrequent	https://www.fisheries.noaa.gov/species/killer-whale
Harbor Seal (*Phoca vitulina*)	MMPA	NMFS	Common	https://www.fisheries.noaa.gov/species/harbor-seal
Northern Fur Seal (*Callorhinus ursinus*)	MMPA	NMFS	Very rare	https://www.fisheries.noaa.gov/species/northern-fur-seal
Steller Sea Lion (*Eumetopias jubatus*)	WDPS: ESA Endangered	NMFS	Common	https://www.fisheries.noaa.gov/species/steller-sea-lion

Species	Status Listing	Jurisdiction	Occurrence	Link to Species Profile
Northern Sea Otter *(Enhydra lutris kenyoni)*	ESA	USFWS	Common	https://www.fws.gov/alaska/pages/endangered-species/northern-sea-otter

Appendix B: Construction Activity and Communication Log

Construction Activity and Communication Log

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

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

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

Appendix C: Marine Mammal Sighting Form

MARINE MAMMAL OBSERVATION RECORD

Project Name: ____________________

Monitoring Location: ____________________

Date: ____________________

Time Effort Initiated: ____________________

Time Effort Completed: ____________________

Page ________ of ________

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

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

Marine Mammal Observation Record – Sighting Codes

Behavior Codes

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

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

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

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

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

Event

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

Sighting Cues

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

Marine Mammal Species

Code	Marine Mammal Species
STSL	Steller Sea Lion
HPBK	Humpback Whale
HAPO	Harbor Porpoise
DAPO	Dall's Porpoise
PSWD	Pacific white-sided dolphin
SO	Sea Otter
HSEA	Harbor Seal
MINKE	Minke Whale
ORCA	Killer Whale

Construction Type

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

Mitigation Codes

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

Visibility

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

Weather Conditions

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

Wave Height

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

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

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

Estimating Wind Speed and Sea State with Visual Clues

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

Appendix D: Grid Maps

Whittier Head of the Bay Cruise Ship Dock Project Grid Map