E 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XF521]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Aak'w Landing Development Project in Juneau, Alaska

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorization; request for comments.

SUMMARY: NMFS has received a request from Turnagain Marine Construction (TMC) for authorization to take marine mammals incidental to the Aak'w Landing Development Project in Juneau, Alaska. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue the requested Incidental Harassment Authorization (IHA). NMFS is also requesting comments on a possible one-time, 1-year renewal of the IHA, if issued, under certain circumstances, provided all requirements are met, as described in **Request for Public Comments** at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the IHA. Agency responses to substantive public comments received in response to this notice will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than [*insert date 30 days after date of publication in the* ***Federal Register***].

ADDRESSES: Comments should be addressed to the Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, and should be submitted via email to *ITP.Daly@noaa.gov*. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/national/marine-mammal-*

protection/incidental-take-authorizations-construction-activities. In case of problems accessing these documents, please call the contact listed below.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will be posted online at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act* without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Jaclyn Daly, Office of Protected Resources, NMFS, (301) 427-8401.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the "take" of marine mammals, with certain exceptions. Section 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) directs the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are proposed or, if the taking is limited to harassment, a notice of a proposed IHA is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking; other "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (collectively referred to as “mitigation”); and requirements pertaining to the monitoring and reporting of the takings. The definitions of all applicable MMPA terms are included below (see also 16 U.S.C. 1362; 50 CFR 216.103).

- *U.S. Citizen* —individual U.S. citizens or any corporation or similar entity if it is organized under the laws of the United States or any governmental unit defined in 16 U.S.C. 1362(13); 50 CFR 216.103);
- *Take* —to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal (16 U.S.C. 1362(13); 50 CFR 216.3);
- *Incidental harassment, Incidental taking, and incidental, but not intentional, taking* —an accidental taking. This does not mean that the taking is unexpected, but rather it includes those takings that are infrequent, unavoidable or accidental (50 CFR 216.103);
- *Level A harassment* —any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild (16 U.S.C. 1362(18); 50 CFR 216.3);
- *Level B harassment* —any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (16 U.S.C. 1362(18); 50 CFR 216.3).

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed action (*i.e.*, the issuance of an IHA) with respect to potential impacts on the human environment.

This action is consistent with categories of activities identified in Categorical Exclusion B4 (IHAs with no anticipated serious injury or mortality) of the Companion Manual for NAO 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has preliminarily determined that the issuance of the proposed IHA qualifies for categorical exclusion from further NEPA review.

Summary of Request

On August 1, 2025, NMFS received a request from TMC for an IHA authorizing the take by Level B harassment of six species of marine mammals and, additionally, take by Level A harassment of five of those species, incidental to the Aak'w Landing Development Project. Following NMFS' review of the application, TMC submitted a revised application on December 23, 2025, and February 19, 2026. NMFS deemed the application adequate and complete on March 9, 2026.

The specified activities include pile removal, vibratory and impact pile driving, down-the-hole (DTH) drilling, and DTH anchoring. These activities have the potential to result in Level A harassment and Level B harassment of six species of marine mammals. Serious injury or mortality is neither anticipated nor proposed to be authorized; therefore, an IHA is appropriate. The IHA would be valid for the statutory maximum of 1 year from the date of effectiveness and would become effective upon written notification from TMC to NMFS, but not beginning later than 1 year from the date of issuance or extending beyond 2 years from the date of issuance.

Description of Proposed Activity

Overview

The proposed Aak'w Landing Development Project is part of a larger effort developing dining, retail, and event spaces, as well as an indigenous knowledge, science, and cultural learning center. The purpose of the project is to construct a cruise ship dock and seawalk adjacent to downtown Juneau. TMC would remove the existing Standard Oil Pier and construct a dock and seawalk as well as restraint and mooring dolphins. TMC would utilize impact and vibratory pile driving, DTH drilling, and DTH anchoring to complete the planned work which may result in marine mammal harassment.

Dates and Duration

The IHA would be effective upon written notification from TMC to NMFS, but not beginning later than 1 year from the date of issuance or extending beyond 2 years from the date of issuance. The specified activities are currently scheduled to begin September 1, 2026, and would occur on approximately 226 days (potentially non-consecutive). However, project delays may occur due to several factors, including project funding, permitting requirements, equipment and/or material availability, weather-related delays, equipment maintenance and/or repair, and other contingencies. Pile removal and installation would occur during daylight hours only, which ranges from 8 to 18 hours per day depending upon the season. No in-water work will occur from April 15 to June 1 to protect out-migrating salmon smolt.

Specific Geographic Region

The project is located adjacent to downtown Juneau on the eastern shore of Gastineau Channel. Comprising part of Southeast Alaska's Inside Passage, Gastineau Channel is a U-shaped, glacier-carved, fjord and narrow channel that, at its approximate midpoint, runs between Juneau (on mainland Alaska) and Douglas Island. The channel is approximately 16 miles (25.7 km) long and its width varies between 4,000 to 6,000 feet (ft) (1219 to 1829 m). The southern end of Gastineau Channel meets Stephens Passage, and the northern, shallower end opens into Auke Bay and Lynn Canal. Gastineau Channel experiences tidal ranges of 16.3 ft (4.9 m) (NOAA, 2025). There are 12 documented anadromous fish streams in the vicinity of the project (Alaska Department of Fish and Game [ADF&G] 2025a); each supporting at least one species of Pacific salmon.

The Juneau waterfront is heavily influenced by industrialization, characterized by a blend of heavy marine industrial activities and significant tourism infrastructure. The waterfront supports commercial seafood processing, fishing, and, historically, major mining operations. Marine mammals within the area are consistently subjected to commercial and recreational vessel traffic, most notably large cruise ships.

Figure 1 -- Aak'w Landing Development Project Location

Detailed Description of the Specified Activity

TMC is proposing to construct a new dock, seawalk, and associated infrastructure in Juneau, Alaska. The new dock would accommodate a class of increasingly larger cruise ships, provide additional safe harbor in Juneau, and reduce marine traffic congestion in Gastineau Channel by allowing docked ships to spread out across the waterfront and eliminating ship-to-shore boat trips. More details on the purpose and need of the project can be found in section 1.2.2 of TMC's application.

To complete the project, TMC would remove the existing Standard Oil Pier, install and remove temporary template piles, and install permanent piles using a vibratory hammer, impact hammer, and drilled shaft (table 1) to construct a dock, seawalk, vehicle trestle, pedestrian walking trestle, mooring trestle, restraint dolphins, and mooring dolphins. In total, up to 160 existing wood piles would be removed, up to 160 temporary template piles would be installed and subsequently removed, and 268 permanent piles would be installed. Below we provide a summary of the planned work; please see sections 1.2.3 and 1.2.4 of TMC's application for more details.

Removal of Standard Oil Pier

The existing Standard Oil Pier, comprised of 281 20-in wood piles, would be removed using a dead pull method via a crane or, if this is not feasible, by vibrating out the piles using a vibratory hammer. TMC expects that it will take approximately 5 minutes to remove each pile and up to 20 piles per day could be removed resulting in approximately 15 days of work. Because the dead-pull method would not generate in-water noise, only use of the vibratory hammer has the potential to result in take, by Level B harassment, of marine mammals. Level A harassment from pile removal is not anticipated or proposed to be authorized. For purposes of their application, TMC conservatively assumes all piles would need to be removed using a vibratory hammer; however, this is unlikely.

Permanent Pile Installation

Permanent piles would be installed to construct the dock (n=66), seawalk (n=78), and restraint and mooring dolphins (n=16 and 12, respectively). In addition, to construct the vehicle trestle and pedestrian walkway, 68 piles would be installed and, to construct the mooring trestle, 28 piles would be installed. All permanent piles will be installed by vibrating and impact hammering and, where they are installed below -60 ft, DTH drilling to break up the bedrock layer. Additionally, all the 42-in piles and 28 of the 48-in piles would have tension anchors installed using DTH anchoring methods (referred to hereafter as DTH anchoring). First, piles would be vibrated into place. Each piling would then be driven to tip elevation using an impact hammer to seat the piling into the bedrock. Once the 42- and 48-inch piles achieve tip elevation, a DTH hammer would be placed inside the piling to install tension anchors. Piles would be installed to a depth to be determined by geotechnical investigation. The pile would then be anchored with concrete.

Temporary Pile Installation and Removal

Pile templates would be constructed by installing temporary pilings to be used as a guide for positioning permanent pilings. Not all permanent piles will require temporary piles to aid in their installation; however, the exact number of temporary piles necessary to support the permanent piles is currently unknown. TMC will assess the need for temporary piles during construction; however, for purposes of their application, they assume no more than 160 temporary piles will be required.

Piles installed below -60 ft would also require DTH drilling given the bedrock layer is shallow, and therefore vibratory and impact driving alone is insufficient to drive the piles to their needed depth. Unlike permanent piles, the piles would not be anchored using a DTH drilling method as they are temporary. In their application, TMC assumes all 160 piles require DTH drilling. Temporary piles would be extracted using the vibratory hammer. Details regarding pile installation and removal specifications are provided in table 1.

Table 1 -- Aak'w Landing Development Project Pile Installation and Removal Summary

	Pile Removal (wood)	Temporary Pile Installation	Temporary Pile Removal	Permanent Pile Installation	Permanent Pile Installation	Permanent Pile Installation
Diameter of Steel Pile (in)	20	36	36	36	42	48
Vibratory Pile Driving/Removal						
Total Quantity	281	160	160	146	28	94
Expected # Piles Vibrated per Day	20	10	10	10	8	6
Vibratory Time per Pile (minutes)	5	15	15	15	25	35
Expected Number of Days	15	16	16	15	4	16
Impact Pile Driving						
Total Quantity	-	160	-	146	28	94
Expected # Piles Impacted per Day	-	8	-	6	4	4
Number of strikes per Pile	-	1,250	-	2,500	2,500	2,500
Impact Time per Pile (minutes)	-	45	-	60	90	120
Expected Number of Days	-	20	-	25	7	24
Down-the-Hole Drilling[1]						
Total Quantity	-	160	-	-	-	-
Expected # Piles Installed per Day	-	4	-	-	-	-
Total Drilling Time Per Pile (minutes)	-	120	-	-	-	-
Expected Number of Days	-	40	-	-	-	-
Down-the-Hole Drilling/Anchoring[1]						
Total Quantity	-		-	-	28	28
Expected # Piles Installed per Day	-	-	-	-	2	2
Anchor Time Per Pile (minutes)	-	-	-	-	300	360
Expected Number of Days	-	-	-	-	14	14

[1] DTH drilling for temporary and permanent piles is needed to break through bedrock. DTH anchoring for permanent piles is also needed to install the anchors which secure piles in place.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see **Proposed Mitigation** and **Proposed Monitoring and Reporting**).

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of TMC's application summarize available information regarding the status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species. NMFS fully considered all this information, and we refer the reader to these descriptions in the application instead of reprinting the information. Additional information on population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*), and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS' website (*https://www.fisheries.noaa.gov/find-species*).

Table 2 lists all the species or stocks for which take may occur and is proposed to be authorized and summarizes information related to the population or stock, including regulatory status under the MMPA and Endangered Species Act (ESA), as well as the potential biological removal (PBR), where known. The MMPA defines PBR as the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS' SARs). While no serious injury or mortality is anticipated or proposed to be authorized, the PBR and annual mortality and serious injury (M/SI) from anthropogenic sources are included here as gross indicators of the status of the species or stocks and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the geographical area, if known, that comprises that stock. For some species, this area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS' U.S. Alaska SARs (Carretta *et al.*, 2025). All values presented in table 2 are the most recent available at the time of publication, including from the draft 2024 SARs, and are available online at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments.

Table 2 -- Species, Stocks, and the Status of Marine Mammals for Which Take Proposed to be Authorized

Common name	Scientific name[1]	Stock	ESA/MMPA status; Strategic (Y/N)[2]	Stock abundance (CV; N_{min}; most recent abundance survey)[3]	PBR	Annual M/SI[4]
Order Artiodactyla—Infraorder Cetacea—Mysticeti (baleen whales)						
Family Balaenopteridae (rorquals):						
Humpback whale	*Megaptera novaeangliae*	Hawai'i[5]	-,-,N	11,278 (0.56, 7,265, 2020)	127	27.09
		Mex-North Pacific[5]	T, D, Y	918 (N/A, N/A, 2006)	UND	0.57
Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae:						
Killer whale	*Orcinus orca*	Eastern North Pacific (ENP) Alaska Resident	-,-,N	1,920, (N/A, 1,920, 2019)[7]	19	1.3
		ENP Northern Resident	-,-,N	587 (N/A, 587, 2012)	5.9	0.8
		West Coast Transient	-,-,N	349 (N/A, 349, 2018)	3.5	0.4
Family Phocoenidae (porpoises):						

Dall's porpoise	*Phocoenoides dalli*	Alaska	-,-,N	N/A (N/A, N/A, 2015)	UND	37
Harbor porpoise	*Phocoena phocoena*	Northern Southeast Alaska Inland Waters	-,-,N	N/A (N/A, N/A, 1997)	UND	22.5
Order - Carnivora – Pinnipedia						
Family Otariidae (eared seals and sea lions)						
Steller sea lion	*Eumetopias jubatus*	Eastern	-,-,N	36,308 (N/A, 36,308, 2022)[6]	2,178[7]	92.3
		Western	T, D, Y	49,837 (N/A, 49,837[7], 2022)[6]	299[7]	267
Family Phocidae (earless seals)						
Harbor seal	*Phoca vitulina*	Prince William Sound	-,-,N	44,756 (N/A, 41,776, 2015)	1,253	413

[1] Information on the classification of marine mammal species can be found on the web page for The Society for Marine Mammalogy's Committee on Taxonomy (*https://marinemammalscience.org/science-and-publications/list-marine-mammal-species-subspecies/*).
[2] Endangered Species Act (ESA) status: Endangered (E), Threatened (T); MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated as depleted and as a strategic stock under the MMPA.
[3] NMFS marine mammal stock assessment reports online at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*. CV is the coefficient of variation; N_{min} is the minimum estimate of stock abundance. In some cases, a CV is not applicable. N/A indicates data are unknown. UND (undetermined) PBR indicates data are available to calculate a PBR level, but a determination has been made that calculating a PBR level using those data is inappropriate (see the SAR for details).
[4] These values, found in NMFS' SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.*, commercial fisheries, ship strikes). Annual M/SI is often not precisely determined and is sometimes reported as a minimum value or a range.
[5] The majority of humpback whales (98 percent) present in Southeast Alaska are likely to be from the recovered Hawaii stock (Hawaii DPS), about 2 percent are likely to be from the threatened Mexico-North Pacific stock (Mexico DPS), and none are likely to be from the endangered WNP stock (Wade 2021).
[6] N_{best} is best estimate of counts, which have not been corrected for animals at sea during abundance surveys.
[7] Value is for U.S. only, not range wide.

As indicated above, table 2 lists the 6 species (10 total stocks) that temporally and spatially co-occur with the specified activities to the degree that incidental take could potentially occur. TMC's application provides general information on each species and stock provided in table 2 as well as more site-refined information as it relates to the analysis, including information on biologically important areas (BIAs) near the project area. In summary, the occurrence of marine mammals in the project area is species specific with some species (*e.g.*, Dall's porpoise, killer whales) occasionally present while others exhibit more frequent occurrence (*e.g.*, pinnipeds). Marine mammals utilize the project area primarily for foraging and transiting. The northern portion of the Frederick Sound and Stephens Passage humpback whale foraging BIA, which is active June through October, overlaps with the ensonified areas for all DTH drilling activities and vibratory pile driving of 48-in piles. NMFS incorporates this information by reference and therefore does not repeat it here. Please see section 4 in TMC's application for more detailed information on each species.

Marine Mammal Hearing

Hearing is the most vital sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of sound exposure, it is necessary to understand the frequency ranges that marine mammals can hear. Not all marine mammal species have equal hearing capabilities or hear over the same frequency range (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007; 2019) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (behavioral response data, anatomical modeling, *etc.*). Subsequently, NMFS (2018, 2024) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65-decibel (dB) threshold from the normalized composite audiograms, except for lower limits for low-frequency cetaceans, where the lower bound was deemed to be biologically implausible, and the lower bound from Southall *et al.* (2007) was retained. In October 2024, NMFS published its 2024 Updated Technical Guidance, which includes updated thresholds and weighting functions to inform auditory injury estimates and replaces the 2018 Technical Guidance referenced above. This 2024 Updated Technical Guidance represents the best available science. Marine mammal hearing groups and their associated hearing ranges are provided in table 3.

Table 3 -- Marine Mammal Hearing Groups (NMFS, 2024)

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 36 kHz
High-frequency (HF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
Very High-frequency (VHF) cetaceans (true porpoises, *Kogia*, river dolphins, Cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	200 Hz to 165 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	40 Hz to 90 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 68 kHz

* Represents the generalized hearing range for the entire group as a composite (*i.e.*, all species within the group), where individual species' hearing ranges may not be as broad. Generalized hearing range chosen based on approximately 65 dB threshold from composite audiogram, previous analysis in NMFS (2018), and/or data from Southall *et al*. (2007) and Southall *et al*. (2019). Additionally, animals can detect very loud sounds above and below the "generalized" hearing range.

Potential Effects of Specified Activities on Marine Mammals and Their Habitat

This section includes a discussion of how components of the Aak'w Landing Development Project may affect marine mammals and their habitat. The **Estimated Take of Marine Mammals** section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by the specified activities. The **Negligible Impact Analysis and Determination** section considers the content of this section, as well as the **Estimated Take of Marine Mammals** section and the **Proposed Mitigation** section, to draw conclusions regarding the likely impacts of both of the proposed project activities on the reproductive success or survivorship of individuals and whether those impacts are reasonably expected to, or reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

There are a variety of types and degrees of effects on marine mammals, prey species, and habitats that could result from the project. Below is a brief description of the sound sources the projects would generate, the general impacts of these activities, and an analysis of the anticipated impacts on marine mammals from the projects, with consideration of the proposed mitigation measures.

Description of Sound Sources

Impact hammers typically operate by repeatedly dropping and/or pushing a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is impulsive, characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper, 2005). Vibratory hammers install piles by vibrating them and allowing the hammer's weight to drive them into the substrate. Vibratory hammers typically produce less sound (*i.e.*, lower levels) than impact hammers. Peak SPLs may be 180 dB or greater but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman *et al.*, 2009; California Department of Transportation (CALTRANS), 2015; 2020). Sounds produced by vibratory hammers are non-impulsive; compared to sounds produced by impact hammers, the rise time is slower, reducing the probability and severity of injury, and the sound energy is distributed over a greater amount of time (Nedwell and Edwards, 2002; Carlson *et al.*, 2005).

DTH systems use a combination of percussive and drilling mechanisms, with the hammer acting directly on the rock to advance a hole into the rock, and also advance the pile into that hole. The hammer drills through the bedrock using a rotating function like a normal drill, in concert with a hammering mechanism operated by a pneumatic (or sometimes hydraulic) component integrated into the DTH hammer to increase speed of progress through the substrate (*i.e.*, it is similar to a “hammer drill” hand tool). Therefore, DTH systems include both impulsive and continuous components. For this project, TMC would utilize DTH drilling and DTH anchoring methods to install 42- and 46-in piles.

Potential Effects of Underwater Sound on Marine Mammals

The introduction of anthropogenic noise into the aquatic environment from vibratory pile removal, vibratory and impact pile installation, and the DTH drilling and DTH anchoring are the means by which marine mammals may be harassed from TMC's specified activities. Anthropogenic sounds span a broad range of frequencies and sound levels and can have highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and other factors. Broadly, underwater sound from active acoustic sources, such as those in these projects, can potentially result in one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al.*, 1995; Nowacek *et al.*, 2007; Southall *et al.*, 2007; Götz *et al.*, 2009).

We describe the more severe effects of certain non-auditory physical or physiological effects only briefly, as we do not expect that the use of impact/vibratory hammers is reasonably likely to result in such effects (see below for further discussion).

Potential physiological effects from sound sources, particularly impulsive sound, can range from behavioral disturbance or tactile perception to physical discomfort, slight injury to the internal organs and the auditory system, or mortality (Yelverton *et al.*, 1973). Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to high level underwater sound or as a secondary effect of extreme behavioral reactions (*e.g.*, change in dive profile as a result of an avoidance reaction) caused by exposure to sound include neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al.*, 2006; Southall *et al.*, 2007; Zimmer and Tyack, 2007; Tal *et al.*, 2015). However, the Project activities considered here do not involve the use of devices such as explosives or mid-frequency tactical sonar that are associated with these types of effects.

In general, animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall *et al.*, 2007, 2019). Exposure to anthropogenic noise can result in auditory threshold shifts and behavioral responses (*e.g.*, avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). It can also lead to non-observable physiological responses, such as increased stress hormone levels. Additional noise in a marine mammal's habitat can mask acoustic cues used in daily functions, such as communication and predator and prey detection.

The degree of effect of an acoustic exposure on marine mammals is dependent on several factors, including, but not limited to, sound type (*e.g.*, impulsive vs. non-impulsive), signal characteristics, the species, age, and sex class (*e.g.*, adult male vs. mom with calf), duration of exposure, the distance between the noise source and the animal, received levels, behavioral state at time of exposure, and previous history with exposure (Wartzok *et al.*, 2004; Southall *et al.*, 2007). In general, sudden, high-intensity sounds can cause hearing loss, as can longer exposures to lower-intensity sounds. Moreover, any temporary or permanent loss of hearing, if it occurs at all, would occur almost exclusively for noise within an animal’s hearing range. We describe below the specific manifestations of acoustic effects that may occur from the specified activities.

Richardson *et al*. (1995) described zones of increasing effect intensity that might be expected to occur with distance from a source, assuming that the signal is within an animal’s hearing range. First (at the greatest distance) is the area within which the acoustic signal would be audible (potentially perceived) to the animal but not strong enough to elicit any overt behavioral or physiological response. The next zone (closer to the receiving animal) corresponds to the area where the signal is audible to the animal and sufficiently intense to elicit behavioral or physiological responsiveness. The third is a zone within which, for high-intensity signals, the received level is sufficient to cause discomfort or tissue damage to auditory or other systems. Overlaying these zones to some extent is the area within which masking (*i.e.*, when a sound interferes with or masks an animal's ability to detect a signal of interest above the absolute hearing threshold) may occur; the masking zone may vary widely in size.

Hearing Threshold Shifts

NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the audibility threshold at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018, 2024). The amount of threshold shift is customarily expressed in dB. A TS can be permanent or temporary. As described in NMFS (2018, 2024), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal temporal pattern (*e.g.*, impulsive or non-impulsive), the likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, the time to recovery (seconds to minutes or hours to days), the frequency range of the exposure (*i.e.*, spectral content), the hearing frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.*, how the animal uses sound within the frequency band of the signal; *e.g.*, Kastelein *et al.*, 2014), and the overlap between the animal and the source (*e.g.*, spatial, temporal, and spectral).

Temporary Threshold Shift

A temporary threshold shift (TTS) is a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2024) and is not considered an auditory injury (AUD INJ). Based on data from marine mammal TTS measurements (see Southall *et al.*, 2007, 2019), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Finneran *et al.*, 2000, 2002; Schlundt *et al.*, 2000). As described in

Finneran (2015), marine mammal studies have shown that the amount of TTS increases with the 24-hour cumulative sound exposure level (SEL24) in an accelerating fashion: at low exposures with lower SEL24, the amount of TTS is typically small, and the growth curves have shallow slopes. At higher SEL_{24} exposures, the growth curves become steeper and approach a linear relationship with the sound exposure level (SEL).

Depending on the degree (elevation of threshold in dB), duration (*i.e.*, recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to more impactful (similar to those discussed in auditory masking, below). For example, a marine mammal may readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs while the animal is traveling through the open ocean, where ambient noise is lower and competing sounds are fewer. Alternatively, a larger amount and longer duration of TTS sustained during times when communication is critical for successful mother/calf interactions could have more severe impacts. We note that reduced hearing sensitivity, as a simple function of aging, has been observed in marine mammals, as well as in humans and other taxa (Southall *et al.*, 2007), suggesting that strategies exist to cope with this condition to some degree, though likely not without cost.

Many studies have examined noise-induced hearing loss in marine mammals (see Finneran (2015) and Southall *et al.* (2019) for summaries). TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter, 2013). While experiencing TTS, the hearing threshold rises, so the sound must be louder to be heard. In terrestrial and marine mammals, TTS can last from minutes to hours (in cases of strong TTS) (Finneran, 2015). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. For cetaceans, published data on the onset of TTS are limited to captive bottlenose dolphin (*Tursiops truncatus*), beluga whale (*Delphinapterus leucas*), harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*) (Southall *et* *al.*, 2019). For pinnipeds in water, measurements of TTS are limited to harbor seals, northern elephant seals, bearded seals (*Erignathus barbatus*), and California sea lions (Kastak *et al.*, 1999, 2007; Kastelein *et al.*, 2019b, 2019c, 2021, 2022a, 2022b; Reichmuth *et al.*, 2019; Sills *et al.*, 2020). TTS was not observed in spotted (*Phoca largha*) and ringed (*Pusa hispida*) seals exposed to single airgun impulse sounds at levels matching previous predictions of TTS onset (Reichmuth *et al.*, 2016). These studies examine hearing thresholds in marine mammals before and after exposure to intense or long-duration sound. The difference between the pre-exposure and post-exposure thresholds can be used to determine the amount of threshold shift at various post-exposure times.

The amount and onset of TTS depend on the exposure frequency. Sounds below the region of best sensitivity for a species or hearing group are less hazardous than those near the region of best sensitivity (Finneran and Schlundt, 2013). At low frequencies, onset-TTS exposure levels are higher compared to those in the region of best sensitivity (*i.e.*, a low frequency noise would need to be louder to cause TTS onset when TTS exposure level is higher), as shown for harbor porpoises and harbor seals (Kastelein *et al.*, 2019a, 2019c). Note that in general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran, 2015). In addition, TTS can accumulate across multiple exposures, but the resulting TTS would be lower than that from a single, continuous exposure with the same SEL (Mooney *et al.*, 2009; Finneran *et al.*, 2010; Kastelein *et al.*, 2014, 2015). This means that TTS predictions based on the total, SEL_{24}, will overestimate the amount of TTS from intermittent exposures, such as sonars and impulsive sources. Nachtigall *et al.* (2018) describe measurements of hearing sensitivity of multiple odontocete species (bottlenose dolphin, harbor porpoise, beluga, and false killer whale (*Pseudorca crassidens*)) when a warning sound preceded a relatively loud sound. These captive animals were shown to reduce hearing sensitivity when warned of an impending intense sound. Based on these experimental observations of captive animals, the authors suggest that wild animals may dampen their hearing during prolonged exposures or if conditioned to anticipate intense sounds. Another study showed that echolocating animals (including odontocetes) might have anatomical specializations that enable conditioned hearing reduction and filtering of low-frequency ambient noise, including increased stiffness and control of middle ear structures, as well as placement of inner ear structures (Ketten *et al.*, 2021). Data available on noise-induced hearing loss for mysticetes are currently lacking (NMFS, 2024). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species.

Relationships between TTS and PTS thresholds have not been studied in marine mammals, and there are no measured PTS data for cetaceans, but such relationships are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several dB above that inducing mild TTS (*e.g.*, a 40-dB threshold shift approximates PTS onset (Kryter *et al.*, 1966; Miller, 1974), while a 6-dB threshold shift approximates TTS onset (Southall *et al.*, 2007, 2019). Based on data from terrestrial mammals, a precautionary assumption is that the AUD INJ thresholds for impulsive sounds (such as impact pile driving pulses as received close to the source) are at least 6 dB higher than the TTS threshold on a peak-pressure basis, and AUD INJ cumulative sound exposure level thresholds are 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall *et al.*, 2007, 2019). Given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, it is considerably less likely that AUD INJ could occur.

Auditory Injury and Permanent Threshold Shift

NMFS (2024) defines AUD INJ as damage to the inner ear that can result in tissue destruction, such as loss of cochlear neuron synapses or auditory neuropathy

(Houser, 2021; Finneran, 2024). AUD INJ may or may not result in a permanent threshold shift (PTS). PTS is defined as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2024). PTS generally affects only a limited frequency range, and animals with PTS have some level of hearing loss at the relevant frequencies; typically, animals with PTS or other AUD INJ are not functionally deaf (Au and Hastings, 2008; Finneran, 2016). Available data from humans and other terrestrial mammals indicate that a 40-dB threshold shift approximates the onset of PTS (see Ward *et al.*, 1958, 1959; Ward, 1960; Kryter *et al.*, 1966; Miller, 1974; Ahroon *et al.*, 1996; Henderson *et al.*, 2008). However, a variety of terrestrial and marine mammal studies (see Ward *et al.*, 1958; Ward *et al.*, 1959; Ward, 1960; Miller *et al.*, 1963; Kryter *et al.*, 1966; Finneran *et al.*, 2007; Kastelein *et al.*, 2013) indicate that threshold shifts of up to 40 to 50 dB (measured a few minutes after exposure) may be induced without resulting in PTS. PTS levels for marine mammals are estimates; with the exception of a single study unintentionally inducing PTS in a harbor seal (Kastak *et al.*, 2008), no empirical data measure PTS in marine mammals largely due to the fact that, for various ethical reasons, experiments involving anthropogenic noise exposure at levels inducing AUD INJ are not typically pursued or authorized (NMFS, 2024). NMFS has set the PTS onset as an initial threshold shift of 40 dB.

However, after sound exposure ceases or between successive sound exposures, the potential for recovery from hearing loss exists. Thus, because a threshold shift is measured a few minutes after noise exposure does not mean that those initial shifts are persistent (*i.e.*, no recovery). When initial threshold shifts fully recover back to baseline hearing levels, these are considered TTS. PTS indicates there is no full recovery back to baseline hearing levels; however, it does not mean there is no recovery. Rather, PTS indicates incomplete recovery of hearing. Recovery depends on the initial threshold shift amount, the frequency at which the shift occurred, the temporal pattern of exposure (*e.g.*, exposure duration; continuous vs. intermittent exposure), and the physiological mechanisms underlying the shift (*e.g.*, mechanical vs. metabolic). Since recovery is complicated, our current AUD INJ onset criteria do not account for the potential for recovery.

Behavioral Effects

Exposure to noise can also behaviorally disturb marine mammals to a level that rises to the definition of harassment under the MMPA. Generally speaking, NMFS considers a behavioral disturbance that rises to the level of harassment under the MMPA a non-minor response. In other words, not every response qualifies as a behavioral disturbance, and for responses that do, those of higher level or longer duration have the potential to affect foraging, reproduction, or survival. Behavioral disturbance may include subtle changes (*e.g.*, minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Behavioral responses may include changing durations of surfacing and dives, changing direction and/or speed; reducing/increasing vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); eliciting a visible startle response or aggressive behavior (such as tail/fin slapping or jaw clapping); and avoiding of areas where sound sources are located. In addition, pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance (Thorson and Reyff, 2006).

Behavioral responses to sound are highly variable and context-specific, and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.*, species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.*, Richardson *et al.*, 1995; Wartzok *et* *al.*, 2004; Southall *et al.*, 2007, 2019; Weilgart, 2007; Archer *et al.*, 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.*, 2012), and can vary depending on characteristics associated with the sound source (*e.g.*, whether it is moving or stationary, number of sources, distance from the source). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see Appendices B and C of Southall *et al.* (2007) and Gomez *et al.* (2016) for reviews of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.*, 2004). Animals are most likely to habituate to predictable, unvarying sounds. It is important to note that habituation is appropriately considered as a "progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial," rather than as, more generally, moderation in response to human disturbance (Bejder *et al.*, 2009). The opposite process is sensitization, in which an unpleasant experience leads to subsequent responses, often in the form of avoidance, at lower levels of exposure.

As noted above, behavioral state may affect the type of response. For example, resting animals may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al.*, 1995; Wartzok *et al.*, 2004; National Research Council (NRC), 2005). Controlled experiments with captive marine mammals have shown pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al.*, 1997; Finneran *et al.*, 2003). Observed responses of wild marine mammals to loud pulsed sound sources (*e.g.*, seismic airguns) have been varied but often consist of avoidance behavior or other behavioral changes (Richardson *et al.*, 1995; Morton and Symonds, 2002; Nowacek *et al.*, 2007).

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal (*e.g.*, Erbe *et al.*, 2019). If a marine mammal briefly reacts to an underwater sound by changing its behavior or moving a small distance, the resulting change is unlikely to be significant to the individual, let alone the stock or population. If a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.*, Lusseau and Bejder, 2007; Weilgart, 2007; NRC, 2005). However, there are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects on breathing, interference with or alteration of vocalization, avoidance, and flight.

Avoidance and Displacement

Changes in dive behavior can vary widely and may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive (*e.g.*, Frankel and Clark, 2000; Costa *et al.*, 2003; Ng and Leung, 2003; Nowacek *et al.*, 2004; Goldbogen *et al.*, 2013a, 2013b; Blair *et al.*, 2016). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g.*, foraging) or they may be of little biological significance. The impact of an alteration in dive behavior resulting from acoustic exposure depends on what the animal is doing at the time of exposure and on the type and magnitude of the response.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (*e.g.*, bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.*, Croll *et al.*, 2001; Nowacek *et al.*, 2004; Madsen *et al.*, 2006; Yazvenko *et al.*, 2007). A determination of whether foraging disruptions incur fitness consequences would require information on, or estimates of, the energetic requirements of the affected individuals, the relationship between prey availability, foraging effort, and success, and the animal's life history stage.

Respiration rates vary naturally with different behaviors, and alterations in breathing rate, as a function of acoustic exposure, can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance of understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g.*, Kastelein *et al.*, 2001; 2005; 2006; Gailey *et al.*, 2007). For example, harbor porpoise respiration rates increased in response to pile driving sounds at and above a received broadband SPL of 136 dB (zero-peak SPL: 151 dB re 1 μPa; SEL of a single strike (SEL_{ss}): 127 dB re 1 μPa^2-s) (Kastelein *et al.*, 2013).

Avoidance is the displacement of an individual from an area or migration path due to the presence of a sound or other stressors and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al.*, 1995). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g.*, Bowles *et al.*, 1994; Goold, 1996; Stone *et al.*, 2000; Morton and Symonds, 2002; Gailey *et al.*, 2007). Longer-term displacement is possible, however, which may lead to changes in the abundance or distribution patterns of the affected species in the affected region if habituation to the sound does not occur (*e.g.*, Blackwell *et al.*, 2004; Bejder *et al.*, 2006; Teilmann *et al.*, 2006).

A flight response is a dramatic change in normal movement, with directed, rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in its intensity (*e.g.*, directed movement and travel rate). Relatively little information exists on the flight responses of marine mammals to anthropogenic signals, although observations of flight responses to the presence of predators have been made (Connor and Heithaus, 1996; Bowers *et al.*, 2018). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (England *et al.*, 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves, 2008), and whether individuals are solitary or in groups may influence the response.

Behavioral disturbance can also affect marine mammals in more subtle ways. Increased vigilance may incur costs from the diversion of attention (*i.e.*, when a response requires heightened vigilance, it may come at the expense of reduced attention to other critical behaviors, such as foraging or resting). These effects have generally not been demonstrated in marine mammals, but studies of fishes and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (*e.g.*, Beauchamp and Livoreil, 1997; Fritz *et al.*, 2002; Purser and Radford, 2011). In addition, chronic disturbance can cause population declines through reductions in fitness (*e.g.*, declines in body condition) and subsequent reductions in reproductive success, survival, or both (*e.g.*, Harrington and Veitch, 1992; Daan *et al.*, 1996; Bradshaw *et al.*, 1998). However, Ridgway *et al.* (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a 5-day period did not result in sleep deprivation or stress.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors, such as sound exposure, is more likely to be significant if it lasts more than one diel cycle or recurs on subsequent days (Southall *et al.*, 2007). Consequently, a behavioral response lasting less than 1 day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.*, 2007). Note that there is a difference between multi-day substantive (*i.e.*, meaningful) behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts multiple days does not necessarily mean that individual animals are exposed to activity-related stressors for multiple days, or, further, exposed in a manner that results in sustained, multi-day, substantive behavioral responses.

Physiological Stress Responses

An animal's perception of a threat may be sufficient to trigger stress responses that include some combination of behavioral, autonomic nervous system, neuroendocrine, and immune responses (*e.g.*, Selye, 1950; Moberg, 2000). In many cases, an animal's first and sometimes most economical response (in terms of energetic costs) is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress, including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in pituitary hormone secretion have been implicated in reproductive failure, altered metabolism, reduced immune competence, and behavioral disturbances (*e.g.*, Moberg, 1987; Blecha, 2000). Increases in glucocorticoid levels are also associated with stress (Romano *et al.*, 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses its glycogen stores, which can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energy reserves to a sufficient level to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.*, Holberton *et al.*, 1996; Hood *et al.*, 1998; Jessop *et al.*, 2003; Krausman *et al.*, 2004; Lankford *et al.*, 2005; Ayres *et al.*, 2012; Yang *et al.*, 2021). Stress responses to exposure to anthropogenic sounds or other stressors, and their effects on marine mammals, have also been reviewed (Fair and Becker, 2000; Romano *et al.*, 2002b) and, more rarely, studied in wild populations (*e.g.*, Romano *et al.*, 2002a). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. In addition, Lemos *et al*. (2022) observed a correlation between higher levels of fecal glucocorticoid metabolite concentrations (indicative of a stress response) and vessel traffic in gray whales. Yang *et al*. (2021) studied behavioral and physiological responses in captive bottlenose dolphins exposed to playbacks of "pile-driving-like" impulsive sounds, finding significant changes in cortisol and other physiological indicators, but only minor behavioral changes. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors, and that some of these responses may be classified as “distress.” In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2005); however, distress is unlikely to result from these projects based on observations of marine mammals during previous, similar construction projects in southeast Alaska.

Vocalizations and Auditory Masking

Since many marine mammals rely on sound to find prey, moderate social interactions, and facilitate mating (Tyack, 2008), noise from anthropogenic sound sources can interfere with these functions, but only if the noise spectrum overlaps with the hearing sensitivity of the receiving marine mammal (Southall *et al.*, 2007; Clark *et al.*, 2009; Hatch *et al.*, 2012). Chronic exposure to excessive, though not high-intensity, noise could cause masking at specific frequencies for marine mammals that rely on sound for vital biological functions (Clark *et al.*, 2009). Acoustic masking is when other noises, such as from human sources, interfere with an animal’s ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.*, those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.*, 1995; Erbe *et al.*, 2016).

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect the detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.*, Clark *et al.*, 2009), and may result in energetic or other costs as animals change their vocalization behavior (*e.g.*, Miller *et al.*, 2000; Foote *et al.*, 2004; Parks *et al.*, 2007; Di Iorio and Clark, 2010; Holt *et al.*, 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al.*, 1995), through amplitude modulation of the signal, or through other compensatory behaviors, including modifications of the acoustic properties of the signal or the signaling behavior (Hotchkin and Parks, 2013). Masking can be tested directly in captive species (*e.g.*, Erbe, 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. Few studies have addressed real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.*, Branstetter *et al.*, 2013).

Masking occurs in the frequency band that the animals use and is more likely to occur in the presence of broadband, relatively continuous noise sources such as vibratory pile removal or installation. The energy distribution of pile-driving sound spans a broad frequency spectrum and is expected to fall within the audible range of marine mammals present in the project areas. Since noises generated from the proposed construction activities are mostly concentrated at low frequencies (<2 kHz), these activities likely have less effect on mid-frequency echolocation sounds produced by odontocetes (toothed whales). However, lower-frequency noises are more likely to affect the detection of communication calls and other potentially important natural sounds, such as surf and prey noise. Low-frequency noise may also affect communication signals when they occur near the noise band, thereby reducing the communication space of animals (*e.g.*, Clark *et al.*, 2009) and increasing stress levels (*e.g.*, Holt *et al.*, 2009). Unlike TS, masking, which can occur over large temporal and spatial scales, can potentially affect the species at population, community, or even ecosystem levels, in addition to individual levels. Masking affects both senders and receivers of signals, and at higher levels and for longer durations could have long-term chronic effects on marine mammal species and populations. However, the noise generated by the TMC's proposed activities would occur only intermittently across 226 days in a relatively small area focused around the proposed construction sites. Thus, while the TMC's proposed activities may mask some acoustic signals relevant to the daily behavior of marine mammals, the short-term duration and limited areas affected make it very unlikely that the fitness of individual marine mammals would be affected.

The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.*, signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.*, sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age, or TTS hearing loss), and existing ambient noise and propagation conditions (Hotchkin and Parks, 2013).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur across any of these modes and may result from a need to compete with increased background noise, or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al.*, 2000; Fristrup *et al.*, 2003) or vocalizations (Foote *et al.*, 2004), respectively, while North Atlantic right whales (*Eubalaena glacialis*) have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.*, 2007). Fin whales (*Balaenoptera physalus physalus*) have also been documented to lower the bandwidth, peak frequency, and center frequency of their vocalizations in the presence of increased background noise from large vessels (Castellote *et al.*, 2012). Other alterations to communication signals have also been observed. For example, gray whales, in response to playback experiments that exposed them to vessel noise, have been observed to increase their vocalization rate and produce louder signals during periods of increased outboard engine noise (Dahlheim and Castellote, 2016). Alternatively, in some cases, animals may cease sound production during the production of aversive signals (Bowles *et al.*, 1994; Wisniewska *et al.*, 2018).

Under certain circumstances, marine mammals that experience significant masking could also be impaired in maximizing their performance fitness for survival and reproduction. Therefore, when the coincident (masking) sound is human-made, it may be considered harassment if it disrupts or alters critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect but rather a potential behavioral effect (though not necessarily one associated with harassment). Therefore, under certain circumstances, marine mammals whose acoustic sensors or environment are severely masked could also be impaired in maximizing their performance fitness for survival and reproduction.

Airborne Acoustic Effects

Pinnipeds occurring near the project site could be exposed to airborne sounds associated with construction activities, depending on their distance from these activities, which could cause behavioral harassment. Airborne noise would primarily be an issue for pinnipeds that are swimming or hauled out near either project site, within the range of noise levels elevated above the airborne acoustic harassment criteria. Cetaceans are not expected to be exposed to airborne sounds that would result in harassment as defined under the MMPA.

We recognize that pinnipeds in the water may be exposed to airborne sound that could result in behavioral harassment when they lift their heads above the water or when they haul out. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as a reduction in vocalizations, or to flush from haulouts, temporarily abandon the area, and/or move further from the source. However, these animals previously would have been "taken" because of exposure to underwater sound above the behavioral harassment thresholds, which are, in all cases, larger than those associated with airborne sound. Thus, the behavioral harassment of these animals is already accounted for in these estimates of potential take. Therefore, authorization of additional incidental take resulting from airborne sound for pinnipeds was not requested by TMC and NMFS has determined is not warranted; airborne sound is not discussed further here.

Potential Effects on Marine Mammal Habitat

TMC's specified activities could have localized, temporary impacts on marine mammal habitat, including prey, due to increased in-water noise levels and water quality degradation. Increased noise levels may affect the acoustic habitat and adversely affect marine mammal prey in the vicinity of the project areas (see discussion below). Elevated levels of underwater noise would ensonify the project areas where both fishes and mammals occur and could affect foraging success. Additionally, marine mammals may avoid the area during the proposed construction activities; however, any displacement due to noise is expected to be temporary and not to result in long-term effects on individuals or populations.

The total area impacted by TMC's proposed activities is relatively small compared to the available habitat within southeast Alaska. While marine mammals may forage in Gastineau Channel near the project area, the waters ensonified do not contain unique or particularly important habitat relative to other waters in southeast Alaska. Moreover, the Juneau waterfront area where the project would occur is industrialized.

Avoidance by potential prey (*i.e.*, fish) of the immediate areas due to increased noise is possible. The duration of fish and marine mammal avoidance of this area after construction stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated. Any behavioral avoidance by fish or marine mammals of either disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity.

The proposed project would occur within the same footprint as existing marine infrastructure. The nearshore and intertidal habitats where the proposed projects would occur are in industrialized areas with relatively high marine vessel traffic. Temporary, intermittent, and short-term habitat alteration may result from increased noise levels during the proposed construction activities. Effects on marine mammal habitat would be limited to temporary displacement from pile removal and installation noise, and effects on prey species would be similarly limited in time and space.

Water Quality

Temporary and localized reduction in water quality would occur as a result of in-water construction activities. Most of this effect would occur during the removal and installation of piles, when bottom sediments are disturbed, and may temporarily increase suspended sediment in the project area. During pile extraction, sediment attached to the pile moves vertically through the water column causing a sediment plume. However, since currents are so strong in the area, following the completion of sediment-disturbing activities, suspended sediment in the water column should dissipate and quickly return to background levels across all construction scenarios.

Turbidity in the water column can reduce dissolved oxygen levels and irritate the gills of prey fish in the proposed project areas. Studies of the effects of turbid water on fish (marine mammal prey) suggest that concentrations of suspended sediment can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton, 1993). However, turbidity plumes associated with the projects would be temporary and localized, and fish in the proposed project areas would be able to move away from and avoid the areas where plumes may occur.

Overall, the water quality in the immediate area that is likely impacted by the proposed construction activities for both projects is relatively small compared to the available marine mammal habitat within and surrounding Juneau. Therefore, it is expected that water quality impacts on prey fish species due to turbidity, and therefore on marine mammals, would be minimal and temporary.

Potential Effects on Prey

Sound may affect marine mammals by altering the abundance, behavior, or distribution of prey species (*e.g.*, crustaceans, cephalopods, fishes, zooplankton). Marine mammal prey varies by species, season, and location, and for some, it is not well documented. Studies regarding the effects of noise on known marine mammal prey are described here.

Fishes use the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.*, Zelick *et al.*, 1999; Fay, 2009). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure- and particle-motion sensitivity and detect the motion of surrounding water (Fay *et al.*, 2008). The potential effects of noise on fishes depends on the overlapping frequency range, distance from the sound source, water depth of exposure, and species-specific hearing sensitivity, anatomy, and physiology. Key impacts on fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality.

Fish react to especially strong and/or intermittent low-frequency sounds, and behavioral responses such as flight or avoidance are the most likely effects. Short-duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to noise depends on their physiological state, past exposures, motivation (*e.g.*, feeding, spawning, migration), and other environmental factors. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fishes (*e.g.*, Scholik and Yan, 2001, 2002; Popper and Hastings, 2009). Several studies have demonstrated that impulse sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g.*, Fewtrell and McCauley, 2012; Pearson *et al.*, 1992; Skalski *et al.*, 1992; Santulli *et al.*, 1999; Paxton *et al.*, 2017). However, some studies have shown no or slight reaction to impulse sounds (*e.g.*, Peña *et al.*, 2013; Wardle *et al.*, 2001; Jorgenson and Gyselman, 2009; Cott *et al.*, 2012). More commonly, though, the impacts of noise on fishes are temporary.

SPLs of sufficient strength have been known to cause injury to fishes and fish mortality (summarized in Popper *et al.*, 2014). However, in most fish species, hair cells in the ear continuously regenerate, and loss of auditory function is likely restored when damaged cells are replaced with new cells. Halvorsen *et al.* (2012b) showed that a TTS of 4-6 dB was recoverable within 24 hours in one species. Impacts would be most severe when the individual fish is near the source, and the exposure duration is long. Injury caused by barotrauma can range from slight to severe and cause death; risk of injury is higher for fish with swim bladders. Barotrauma injuries have been documented during controlled exposure to impact pile driving (Halvorsen *et al.*, 2012a; Casper *et al.*, 2013, 2017).

Fish populations in the proposed project area that serve as prey for marine mammals could be temporarily affected by noise from pile removal and installation. The frequency range in which fishes generally perceive underwater sounds is 50 to 2,000 Hz, with peak sensitivities below 800 Hz (Popper and Hastings, 2009). Fish behavior or distribution may change, especially in response to strong and/or intermittent sounds that could harm fish. High underwater SPLs have been documented to alter behavior, cause hearing loss, and injure or kill individual fish by causing serious internal injury (Hastings and Popper, 2005).

Zooplankton is a food source for several marine mammal species, as well as a food source for fish that are then preyed upon by marine mammals. Population effects on zooplankton could indirectly affect marine mammals. Data are limited on the effects of underwater sound on zooplankton species, particularly sound from construction (Erbe *et al.*, 2019). Popper and Hastings (2009) reviewed information on the effects of human-generated sound and concluded that no substantive data are available on whether sound levels from pile driving, seismic activity, or other human-made sources would have physiological effects on invertebrates. Any such effects would be limited to the area very near (1 to 5 m) the sound source and would result in no population effects because of the relatively small area affected at any one time and the reproductive strategy of most zooplankton species (short generation, high fecundity, and very high natural mortality). No adverse impact on zooplankton populations is expected from the specified activities, due in part to their large reproductive capacity and naturally high levels of predation and mortality. Any mortalities or impacts that might occur would be negligible.

The greatest potential impact on marine mammal prey during construction would occur during impact pile driving. Vibratory pile removal/installation may elicit behavioral responses in fishes, such as temporary avoidance of the area, but is unlikely to cause injuries to fishes or have persistent effects on local fish populations. In-water construction activities would only occur during daylight hours, allowing fish to forage and transit the project area in the evening. Construction would also have minimal permanent and temporary impacts on benthic invertebrate species, a marine mammal prey source.

Potential Effects on Foraging Habitat

The proposed projects are not expected to result in any habitat-related effects that could cause significant or long-term negative consequences for individual marine mammals or their populations, since removal and installation of in-water piles would be temporary and intermittent. The areas affected by these projects are relatively small compared to the available habitat just outside the project areas, and neither project would affect any areas of particular importance. Any behavioral avoidance by fish in the disturbed areas would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. As described in the preceding, the potential for the TMC's activities to affect the availability of prey to marine mammals or to meaningfully impact the quality of physical or acoustic habitat is considered to be insignificant. Therefore, the impacts of the projects are not likely to adversely affect marine mammal foraging habitat in the proposed project areas.

In summary, given the relatively small areas being affected, as well as the temporary and mostly transitory nature of the proposed construction activities, any adverse effects from TMC's activities on prey habitat or prey populations are expected to be minor and temporary. The most likely impact on fishes at the project sites would be temporary avoidance of the area. Any behavioral avoidance by fish in the disturbed areas would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. Thus, we conclude that the impacts of the specified activities are not likely to have more than short-term adverse effects on any prey habitat or populations of prey species. Further, any impacts on marine mammal habitat are not expected to result in significant or long-term consequences for individual marine mammals or to contribute to adverse impacts on their populations.

Estimated Take of Marine Mammals

This section provides an estimate of the number of incidental takes proposed for authorization which, in part, informs NMFS' consideration of "small numbers," the negligible impact determination, and effects on the availability of marine mammals for subsistence use.

Harassment is the only type of take expected to result from these activities. Except for certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by disrupting behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would predominantly be by Level B harassment, as using acoustic sources (*i.e.*, vibratory and impact pile driving) can potentially disrupt behavioral patterns for individual marine mammals. There is also some potential for AUD INJ (Level A harassment) to result for four species of marine mammals. The proposed mitigation and monitoring measures for both projects are expected to minimize the amount and severity of the taking to the extent practicable.

As previously described, no serious injury or mortality is anticipated or proposed to be authorized for either proposed activity. Below, we describe how the proposed take numbers are estimated.

For acoustic impacts, generally speaking, we estimate take by considering (1) acoustic criteria above which NMFS believes the best available science indicates that there is some reasonable potential for marine mammals to be behaviorally harassed or incur some degree of AUD INJ; (2) the area or volume of water that would be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) the number of days of activities. While these factors are incorporated into a basic calculation to provide an initial prediction of potential takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.*, previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the proposed take estimates.

Acoustic Criteria

NMFS recommends the use of acoustic criteria that identify the received level of underwater sound above which exposed marine mammals would reasonably expect to be behaviorally harassed (equated to Level B harassment) or incur AUD INJ of some degree (equated to Level A harassment). Below, we describe the thresholds used by TMC and NMFS for this analysis.

Level B Harassment

Though significantly driven by the received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors. These factors are related to the source or exposure context (*e.g.*, frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source), the environment (*e.g.*, bathymetry, other noises in the area, predators in the area), and the receiving animals (hearing, motivation, experience, demography, life stage, depth) and can be difficult to predict (*e.g.*, Southall *et al.*, 2007; Ellison *et al.*, 2012). Based on available science and the practical need to use a threshold based on a predictable, measurable metric for most activities, NMFS typically uses a generalized acoustic threshold based on the received level to estimate the onset of behavioral harassment. NMFS generally predicts that marine mammals are likely to be behaviorally harassed in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above root-mean-squared sound pressure levels (RMS SPL) of 120 dB re 1 μPa for continuous (*e.g.*, vibratory pile driving, drilling) and above RMS SPL 160 dB re 1 μPa for non-explosive impulsive (*e.g.*, seismic airguns) or intermittent (*e.g.*, scientific sonar) sources. Level B harassment estimates based on these behavioral harassment thresholds potentially include TTS, as, in most cases, TTS likely occurs at distances from the source less than those at which behavioral harassment may occur. TTS of sufficient degree can manifest as behavioral harassment and reduced hearing sensitivity, and the potential reduction in opportunities to detect important signals (conspecific communication, predators, prey) may result in behavior patterns that would not otherwise occur.

TMC's proposed activities include continuous (vibratory pile driving, DTH drilling and DTH anchoring) and intermittent (impact pile driving, DTH drilling, DTH anchoring) sources. Therefore, the Level B harassment thresholds of 120 dB and 160 dB re 1 μPa are applicable.

Level A Harassment

NMFS' Updated Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0) (NMFS, 2024) identifies dual criteria to assess AUD INJ (Level A harassment) to five different underwater marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). It includes updated thresholds and updated weighting functions for each hearing group, provided in table 4 below. The references, analysis, and methodology used to develop the criteria are described in NMFS' 2024 Updated Technical Guidance, available at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance-other-acoustic-tools*.

Table 4 -- Thresholds Identifying the Onset of Auditory Injury

	AUD INJ Onset Acoustic Thresholds* (Received Level)	
Hearing Group	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{pk,flat}$: 222 dB $L_{E,LF,24h}$: 183 dB	*Cell 2* $L_{E,LF,24h}$: 197 dB
High-Frequency (HF) Cetaceans	*Cell 3* $L_{pk,flat}$: 230 dB $L_{E,HF,24h}$: 193 dB	*Cell 4* $L_{E,HF,24h}$: 201 dB
Very High-Frequency (VHF) Cetaceans	*Cell 5* $L_{pk,flat}$: 202 dB $L_{E,VHF,24h}$: 159 dB	*Cell 6* $L_{E,VHF,24h}$: 181 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{pk,flat}$: 223 dB $L_{E,PW,24h}$: 183 dB	*Cell 8* $L_{E,PW,24h}$: 195 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{pk,flat}$: 230 dB $L_{E,OW,24h}$: 185 dB	*Cell 10* $L_{E,OW,24h}$: 199 dB

*Dual metric criteria for impulsive sounds: Use whichever criterion results in the larger isopleth for calculating AUD INJ onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level criteria associated with impulsive sounds, the PK SPL criteria are recommended for consideration for non-impulsive sources.

Note: Peak sound pressure level ($L_{p,0\text{-}pk}$) has a reference value of 1 μPa, and weighted cumulative sound exposure level ($L_{E,p}$) has a reference value of 1 $\mu Pa^2 s$. In this table, criteria are abbreviated to better reflect International Organization for Standardization (ISO) standards (ISO, 2017). The subscript "flat" is being included to indicate that peak sound pressures are flat weighted or unweighted within the generalized hearing range of marine mammals underwater (*i.e.*, 7 Hz to 165 kHz). The subscript associated with cumulative sound exposure level criteria indicates the designated marine mammal auditory weighting function (LF, HF, and VHF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The weighted cumulative sound exposure level criteria could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, action proponents should indicate the conditions under which these criteria would be exceeded.

Ensonified Area

Here, we describe the operational and environmental parameters of the activity used to estimate the area ensonified above the acoustic thresholds, including source levels and the transmission loss coefficient.

Source levels applied to this project were derived from acoustic data collected during installation of identical or similar sized piles in Alaska and the U.S. west coast (table 5).

Table 5 -- Proxy Sound Source Levels for Pile Sizes and Driving Methods

Method and Pile Type	Source Level @ 10m	Reference
Vibratory	**dBrms**	

20-in wood	162			**Caltrans 2020**
36-in steel	166			PR1 2023 Calculations[1]
42-in steel	170			PR1 2023 Calculations[1]
48-in steel	171			PR1 2023 Calculations[1]
Impact	**dB rms**	**dB SEL**	**dB peak**	
36-in steel	193	183	210	Caltrans 2015, 2020
42-in steel	192	179	213	Caltrans 2020
48-in steel	192	179	213	Caltrans 2020
DTH Drilling & DTH Anchoring	**dB rms**	**dB SEL**	**dB peak**	
36-in steel	174	164	194	NMFS 2022a
42-in steel	174	164	194	NMFS 2022a
48-in steel	178	168	-	NMFS 2022a

[1] Source level estimation methodology followed Navy (2015) and included available data from Puget Sound, WA and Southern Alaska.

Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, bottom composition, and topography. The general formula for underwater TL is:

$$TL = B * Log_{10} (R_1/R_2),$$

where

TL = transmission loss in dB

B = transmission loss coefficient; for practical spreading equals 15

R_1 = the distance of the modeled SPL from the driven pile, and

R_2 = the distance from the driven pile of the initial measurement.

This formula neglects loss due to scattering and absorption, which is assumed to be zero here. The degree to which underwater sound propagates away from a sound source depends on various factors, most notably the water bathymetry and the presence or absence of reflective or absorptive conditions, including in-water structures and sediments. Spherical spreading occurs in a perfectly unobstructed (free-field) environment not limited by depth or water surface, resulting in a 6 dB reduction in sound level for each doubling of distance from the source (20*log[range]). Cylindrical spreading occurs in an environment in which sound propagation is bounded by the water surface and sea bottom, resulting in a reduction of 3 dB in sound level for each doubling of distance from the source (10*log[range]). A practical spreading value of 15 is often used in coastal waters, such as those found in the Aak'w Landing project area. In these environments, sound waves repeatedly reflect off the surface and bottom, reflecting an expected propagation environment between spherical and cylindrical spreading-loss conditions. Therefore, the default coefficient of 15 is used to calculate distances to the Level A harassment and Level B harassment isopleths.

Assuming practicable spreading and other assumptions regarding the source characteristics and operational logistics (*e.g.*, source level, number of strikes per pile, number of piles per day), TMC calculated distances to the Level A harassment and Level B harassment isopleths and associated ensonified areas. Because an ensonified area associated with Level A harassment is more technically challenging to predict given the accounting for a cumulative energy component that changes over time and animal movement, NMFS developed an optional User Spreadsheet tool to assist applicants in assessing the potential for Level A harassment without the need for complex modeling (*https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance-other-acoustic-tools*). This relatively simple tool can be used to calculate a Level A harassment isopleth distance for use in conjunction with marine mammal density or occurrence data to predict the amount of take that may occur incidental to an activity. The resulting isopleth does not account for animal movement and represents the distance at which an individual would have to remain for the entire duration of pile driving or DTH within a day. As the amount of time considered in the calculation becomes longer, the likelihood of an individual accumulating noise energy above threshold at that distance becomes less realistic. However, individuals may approach a source more closely than the calculated distance in which case the amount of time needed to elicit the onset of AUD INJ decreases. While the risk of AUD INJ is low overall due to expected avoidance behavior, the User Spreadsheet offers a practical alternative for estimating isopleth distances when more sophisticated modeling methods are unavailable or are impractical.

Using the practical spreading model and assumptions identified in tables 1 and 5, TMC calculated, and NMFS has carried forward into this analysis, the distances to the Level A harassment and Level B harassment thresholds for marine mammals (table 6).

Table 6 -- Calculated Distances to Level A Harassment and Level B Harassment Acoustic Thresholds and Associated Ensonifed Areas

Activity	Threshold Distance (m) (Ensonified Area (km^2))					
	Level A harassment					Level B harassment
	LFC	HFC	VHFC	PH	OT	
Vibratory Pile Driving/Removal						
20-inch wood pile removal	15.1 (0.019)	5.8 (0.007)	12.3 (0.015)	19.5 (0.025)	6.5 (0.012)	6,309.6 (5.779)
36-inch steel temporary pile installation	36.6 (0.047)	14.1 (0.017)	29.9 (0.038)	47.1 (0.062)	15.9 (0.020)	11,659.1 (10.350)
36-inch steel temporary pile removal	36.6 (0.047)	14.1 (0.017)	29.9 (0.038)	47.1 (0.062)	15.9 (0.020)	11,659.1 (10.350)
36-inch steel permanent pile installation	36.6 (0.047)	14.1 (0.017)	29.9 (0.038)	47.1 (0.062)	15.9 (0.020)	11,659.1 (10.350)
42-inch steel permanent pile installation	81.9 (0.112)	31.5 (0.049)	66.9 (0.090)	105.5 (0.148)	35.5 (0.046)	21,544.3 (24.010)
48-inch steel permanent pile installation	98.7 (0.137)	37.9 (0.049)	80.6 (0.110)	127.0 (0.182)	42.8 (0.056)	25,118.9 (30.602)
Impact Pile Driving						
36-inch steel temporary pile installation	4,618.4 (4.664)	589.3 (1.291)	7,147.0 (6.343)	4,102.0 (4.305)	1,529.3 (2.645)	1,584.9 (2.700)
36-inch steel permanent pile installation	6,051.8 (5.618)	772.1 (1.710)	9,365.2 (8.127)	5,376.2 (5.211)	2,004.0 (3.113)	1,584.9 (2.700)
42-inch steel permanent pile installation	2,499.3 (3.462)	318.9 (0.566)	3,867.7 (4.158)	2,220.3 (3.297)	827.6 (1.821)	1,359.4 (2.50)
48-inch steel permanent pile installation	2,499.3 (3.462)	318.9 (0.566)	3,867.7 (4.158)	2,220.3 (3.297)	827.6 (1.821)	1,359.4 (2.50)
Down-the-Hole Drilling/Anchoring						
36-inch temporary pile installation	2,348.3 (3.382)	299.6 (0.522)	3,634.0 (4.020)	2,086.1 (3.187)	777.6 (1.721)	39,811[1] (37.487)

42-inch permanent pile installation	2,725.0 (3.560)	347.7 (0.635)	4,216.9 (4.381)	2,420.7 (3.424)	902.3 (1.958)	39,811[1] (37.487)
48-inch permanent pile installation	5,686.1 (5.404)	725.5 (1.612)	8,799.2 (7.652)	5,051.3 (4.981)	1,882.9 (2.995)	73,564[1] (37.487)

[1] Land truncates the calculated distance to approximately 30.5km resulting in an ensonified area of 37.5km^2.

Marine Mammal Occurrence

In this section, we provide information on the anticipated occurrence of marine mammals present in the project area that informs the take calculations in the following section (see Take Estimation and table 8).

Density estimates are not readily available for the project area; therefore, TMC reviewed scientific literature and marine mammal occurrence data collected previously by IHA holders conducting monitoring in the same area. They also consulted local Juneau marine mammal subject matter experts to estimate the occurrence of marine mammals that may be taken incidental to the specified activities (table 7). More information regarding literature and sources cited can be found in section 6.1 of TMC's application.

Further, NMFS consulted information available for past projects conducted at the Juneau waterfront and determined the TMC's proposed occurrence rate of harbor seals is likely an underestimate and modified, in coordination with TMC, the harbor seal occurrence rate for this proposed IHA. In their application, TMC assumed 4 harbor seals per day may be within the ensonified area based on data from Auke Bay which is located to the northwest of the project area. However, in 2019, NMFS received a request for an IHA modification that contained harbor seal monitoring data collected prior to the Downtown Waterfront Improvements Project, Juneau; the data indicated an average of 26 seals/day were observed between November 4 and 14, 2019 (*https://www.fisheries.noaa.gov/action/incidental-take-authorization-juneau-waterfront-improvement-project-juneau-alaska*). Because the 2019 data were collected essentially at the same location as the Aak'w Landing location, NMFS has applied those data to the take estimates. TMC agreed this approach was appropriate to ensure MMPA compliance (*i.e.*, enough take is authorized) during the project.

Table 7 -- Estimated Occurrence of Marine Mammals, by Species, near Juneau

Species	Occurrence	Frequency	Group Size	No. of Animals Expected
humpback whale	infrequent	4 groups/month	2	8/month
killer whale	infrequent	1 group/month	6	6/month
Dall's porpoise	infrequent	1 group/month	6	6/month
harbor porpoise	infrequent	1 group/month	2	2/month
harbor seal	common	26/day	n/a	26/day
Steller sea lion[1]	common	2 groups/day	2	4/day

[1] TMC assumes 4 Steller sea lions may be within the ensonified area per day based on data from Auke Bay. However, they also recognize that additional sea lions from the Circle Point haulout may transit through the Level B harassment zone during the specified activities. Please see the estimated take section below for more information on how the presence of sea lions at this haulout were factored into the take calculations.

Take Estimation

In this section, we describe how the project scope, ensonified area, and species occurrence information provided above are used to produce a quantitative estimate of the take that could occur and is proposed for authorization.

As described above, density is not available in the project area; therefore, TMC applied a simplistic approach which assumed that all animals potentially within the project area on any given day may be taken by harassment. Overall, the resulting formula for determining the number of takes that may occur incidental to the project is:

Total take by harassment = occurrence estimate (in days) x pile activity days

For species where a number of individuals per month was estimated based on the best available science, TMC used the same approach; however, to compensate for the monthly estimate, they applied a 30-day correction factor to convert the number of animals observed per month into a daily sighting rate (*e.g.*, 30 harbor seals per month equates to 1 harbor seal per day).

For vibratory pile driving, it is unlikely that Level A harassment would occur; therefore, all takes calculated incidental to this activity were attributed to Level B harassment. Moreover, for killer whales and harbor porpoise, Level A harassment incidental to impact pile driving and DTH activities is also unlikely. The calculated distance to Level A harassment thresholds for killer whales is relatively short (see table 6) and represents extended durations. Because an animal is unlikely to remain in such close proximity to the piles for that time, AUD INJ is unlikely to occur. Further, killer whales are a highly visible species such that PSOs are likely to detect them and implement mitigation to avoid Level A harassment. The best available science demonstrates that harbor porpoises are behaviorally sensitive species and exhibit strong reactions to impulsive noise such as impact pile driving. For example, displacement of harbor porpoises has been observed during impact pile driving associated with the construction at multiple offshore wind projects (Tougaard *et al.*, 2009; Bailey *et al.*, 2010; Dähne *et al.*, 2013; Lucke *et al.*, 2012; Haelters *et al.*, 2015; Brandt *et al.*, 2018). These studies document long-distance (*i.e.*, several kilometers) displacement; however, the duration of displacement has been documented to generally be temporary. The piles involved in coastal construction projects are smaller than those in these studies; however, other data support predicted avoidance responses wherein porpoise move away from a man-made sound source; thereby reducing accumulated noise energy. For example, Kok *et al.* (2018) found that two captive harbor porpoises spatially avoided a noisy pool when exposed to intermittent or continuous sound stimuli. In summary, harbor porpoises are likely to avoid coastal construction-related sound sources associated with the project to the degree that AUD INJ is unlikely. For these reasons, NMFS is not proposing to authorize Level A harassment for killer whales and harbor porpoise.

For those species where Level A harassment is expected to occur, TMC assumed that all animals present within the project area on days when activities with the potential for Level A harassment occurs (*i.e.*, impact hammering and DTH activities; 144 days) could incur Level A harassment. The remaining takes, based on the total amount of take calculated, are predicted to result in Level B harassment only.

To understand the potential for the total number of takes incidental to impact pile driving and DTH activities to be by Level A harassment for humpback whales, harbor seals, and Steller sea lions, TMC considered the number of days these activities may occur (n = 144) and calculated take using this value:

Level A harassment = occurrence estimate (in days) x 144 days

To estimate the number of takes by Level B harassment incidental to impact pile driving and DTH activities, TMC subtracted the number of takes by Level A harassment from the total takes calculated via the equation above. NMFS acknowledges that the number of estimated exposures above higher threshold criteria using the methodology (*e.g.*, sound exposures exceeding Level A harassment criteria), also encompasses the potential for less impactful effects (*e.g.*, Level B harassment). An individual exposure exceeding a Level A harassment criterion may not result in actual AUD INJ, yet the individual may have experienced Level B harassment. This outcome is accounted for in our authorization of potential higher-level takes and in our analysis.

Level B harassment = Total take by harassment – Level A harassment

For Steller sea lions, TMC also considered the presence of a nearby haulout site. Circle Point, a minor haulout approximately 27.80 km to the southeast of the project site, is within the DTH drilling and DTH anchoring Level B harassment zones. A minor haulout is one that supports fewer than 200 animals or is used irregularly. Given the haulout is used intermittently, when used may support anywhere from 1 to 199 individuals, and is located relatively far from the project site (although within the Level B harassment zone), TMC has added 199 exposures to the calculated total take estimate for this species. Given the variability in haulout use, TMC determined, and NMFS agrees, that assuming 199 animals would be exposed during every day that DTH activities would occur would be a gross overestimate of take and that the resulting number of takes using this method is reasonable. Methods for attributing a proportion of those takes to Level A harassment incidental to impact pile driving and DTH drilling and DTH anchoring follows the methodology described above. Remaining takes are attributed to Level B harassment.

Using the calculations described above, TMC has requested, and NMFS proposes to authorize, the number of takes identified in table 8. The proportion of the stock values presented in table 8 reflects the assumption that each take is of a different individual and, where takes may occur to any stock of a given species, that all takes proposed to be authorized are attributed to each stock. For porpoise and killer whales which tend to transit through the area, it is possible that takes are of unique individuals. However, for species which demonstrate some residency or persistence (humpback whales and pinnipeds), it is likely that fewer number of individuals than the number of takes proposed to be authorized will be harassed repeatedly. Further, for humpback whales, killer whales, and Steller sea lions, it is unlikely that all takes authorized would occur to only one stock. For these reasons, the proportion of stock values in table 8 are likely overestimates for all species except porpoises.

Table 8 -- Number of Takes, by Level A harassment and Level B harassment, Proposed to be Authorized.

<table>
<tr><th rowspan="2">Species</th><th rowspan="2">Stock</th><th colspan="2">Proposed Take</th><th rowspan="2">Total Take</th><th rowspan="2">Percent of Stock[1]</th></tr>
<tr><th>Level A</th><th>Level B</th></tr>
<tr><td rowspan="2">Humpback whale</td><td>Hawaii</td><td>38</td><td>21</td><td>59</td><td><1</td></tr>
<tr><td>Mexico-N. Pacific[2]</td><td>1</td><td>1</td><td>2</td><td>7</td></tr>
<tr><td rowspan="3">Killer whale</td><td>East coast transient</td><td rowspan="3">0</td><td rowspan="3">46</td><td rowspan="3">46</td><td>13</td></tr>
<tr><td>Eastern North Pacific Northern Resident</td><td>15</td></tr>
<tr><td>Eastern North Pacific Alaska Resident</td><td>2</td></tr>
<tr><td>Dall's porpoise</td><td>Alaska</td><td>29</td><td>17</td><td>46</td><td><1</td></tr>
<tr><td>Harbor porpoise</td><td>Northern Southeast Alaska Inland Waters</td><td>0</td><td>16</td><td>16</td><td><1</td></tr>
</table>

Harbor seal	Lynn Canal/Stephens Passage	3,744	2,132	5,876	44
Steller sea lion	Eastern	568	441	1,009	3
	Western[3]	8	6	14	2

[1] The values presented here are based on calculations assuming all takes were to a different individual. However, repeated takes of the same individual are more likely to occur for species remaining within the area to forage (*e.g.*, humpback whales) and those displaying increased site fidelity (*e.g.*, harbor seals, Steller sea lions). Therefore, the actual percentage of the population taken is less than provided here.

[2] Approximately 2.4 percent of the humpbacks encountered during the project are expected to belong to the Mexico DPS. Therefore, NMFS expects one take by Level A harassment and one take by Level B harassment for the Mexico-North Pacific stock.

[3] Approximately 1.4 percent of Steller sea lions encountered during the project are expected to belong with the Western DPS. Therefore, NMFS expects eight takes of the western stock by Level A harassment and six takes by Level B harassment.

Proposed Mitigation

To issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations (ITA) to include information about the availability and feasibility (economic and technological) of equipment, methods, and the manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, NMFS considers two primary factors:

(1) How and to what degree the successful implementation of the measure(s) is expected to reduce impacts on marine mammal species or stocks and their habitat. This considers the nature of the potential adverse impact being mitigated (its likelihood, scope, and range). It further considers the likelihood that the measure would be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability of implementation as planned); and

(2) The practicability of the measures for applicant implementation, which may consider such things as cost and impact on operations.

The number and/or intensity of incidents of takes will be minimized through the incorporation of the mitigation measures that were proposed by TMC. TMC has agreed that all of the mitigation measures are practicable and NMFS agrees that these measures are sufficient to achieve the least practicable adverse impact on the affected marine mammal species or stocks and their habitat and have included them in the IHA as proposed mitigation requirements.

Establishment of Clearance and Shutdown Zones

TMC proposed, and NMFS would require, the establishment of clearance and shutdown zones identified in table 10 for pile removal, installation, DTH drilling, and DTH anchoring. The purpose of "clearance" of a particular zone is to prevent potential instances of auditory injury and more severe behavioral disturbance the maximum extent practicable by delaying the commencement of impact pile driving if marine mammals are detected within certain pre-defined distances from the pile being installed. The purpose of a shutdown is to prevent a specific acute impact, such as auditory injury or severe behavioral disturbance of sensitive species, by halting the activity. Additionally, to avoid unauthorized takes, TMC would delay an activity or shut down in the event that a species for which take is not authorized or for which take has been reached is observed within or entering any designated harassment zone. If pile driving or DTH activities are delayed or halted due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily exited and been visually confirmed beyond the clearance and shutdown zones indicated in table 9 or 15 minutes have passed without re-detection of the animal.

In-water construction activities that do not include the specified activities but require heavy equipment will also shut down if a marine mammal approaches within 10 m to avoid direct interaction.

In general, the clearance and shutdown zones represent the calculated Level A harassment distance rounded up for ease of implementation. However, a maximum shutdown zone of 2,000 m for low frequency cetaceans and 300 m for very high frequency cetaceans and pinnipeds will be maintained due to detectability and/or practicability. In addition, NMFS is proposing a maximum 25m clearance and shutdown zone be maintained for harbor seals. Data collected by the City and Borough of Juneau in 2019 indicates that extended mitigation zones would not be practicable as harbor seals are frequently observed in close proximity (within 130 m) to the project site such that the specified activities would not be able to commence or continue to the degree that the project could be completed within reasonable time frames. For the City and Borough of Juneau, harbor seal presence close to the pile driving location resulted in a need for a modified IHA to reduce original shutdown zone sizes (*https://www.fisheries.noaa.gov/action/incidental-take-authorization-juneau-waterfront-improvement-project-juneau-alaska*). NMFS has applied that experience to this Aak'w Landing project. NMFS notes that TMC's application proposed a 300m shutdown for harbor seals; however, TMC was unaware these data existed during development of their application nor of the prior need for the City and Borough of Juneau's modified IHA (85 FR 18562, April 2, 2020).

Table 9 – Clearance, Shutdown, and Level B Harassment Zones

<table>
<tr><th rowspan="2">Activity</th><th colspan="5">Clearance and Shutdown Distances from Source (m)</th><th>Level B harassment zone (km)[1]</th></tr>
<tr><th>LFC</th><th>HFC</th><th>VHFC</th><th>PH</th><th>OT</th><th></th></tr>
<tr><td colspan="7">Vibratory Pile Driving/Removal</td></tr>
<tr><td>20-inch wood (removal)</td><td>20</td><td>10</td><td>15</td><td>25</td><td>10</td><td>6.3</td></tr>
<tr><td>36-inch steel (temporary/permanent)</td><td>40</td><td>15</td><td>30</td><td>25</td><td>20</td><td>11.7</td></tr>
<tr><td>42-inch steel</td><td>85</td><td>35</td><td>70</td><td>25</td><td>40</td><td>21.5</td></tr>
<tr><td>48-inch steel</td><td>100</td><td>40</td><td>85</td><td>25</td><td>45</td><td>25.1</td></tr>
<tr><td colspan="7">Impact Pile Driving</td></tr>
<tr><td>36-inch steel (temporary)</td><td rowspan="4">2,000</td><td>590</td><td rowspan="4">300</td><td rowspan="4">25</td><td rowspan="4">300</td><td rowspan="2">1.6</td></tr>
<tr><td>36-inch steel (permanent)</td><td>780</td></tr>
<tr><td>42-inch steel (permanent)</td><td rowspan="2">320</td><td rowspan="2">1.4</td></tr>
<tr><td>48-inch steel (permanent)</td></tr>
<tr><td colspan="7">DTH Drilling and Anchoring</td></tr>
</table>

36-inch steel (temporary)	2,000	300	300	25	300	30.5
42-inch steel (permanent)		350				
48-inch steel (permanent)		730				

Soft-Start

TMC would use soft-start procedures for impact pile driving to provide additional protection to marine mammals by issuing a warning and/or giving them a chance to leave the area before the hammer operates at full capacity. Soft-start requires contractors to provide an initial set of three strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced-energy strike sets. This soft-start would be implemented at the start of each day's impact pile driving and at any time following cessation of this activity for a period of 30 minutes or longer within a day.

Bubble Curtains

TMC has not proposed to use a bubble curtain during pile installation, due to economic and temporal impracticability. In general, bubble curtains reduce noise levels near the source, minimizing exposure levels. However, requiring use of a bubble curtain would reduce the number of piles that could be installed in a day due to the time it takes to install and move the device. Therefore, the duration (months) over which the project would occur would be extended, increasing project costs and exposing marine mammals to underwater sound over longer time periods. For these reasons, TMC has determined, and NMFS agrees, that use of a bubble curtain is not practicable.

Vessel Strike Avoidance

Implementation of the vessel strike avoidance measures proposed by TMC is expected to reduce the risk of vessel strike to the degree that vessel strike would be avoided. While the likelihood of a vessel strike is generally low without these measures, vessel interaction is one of the most common ways that marine mammals are seriously injured or killed by human activities. TMC vessels will adhere to the Alaska Humpback Whale Approach Regulations (50 CFR 216.18, 223.214, and 224.103(b)) when transiting to and from the project site and operate at a slow, safe speed when near a humpback whale (33 CFR 83.06).

All specific proposed monitoring, and reporting requirements can be found in a draft IHA for this action at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*.

Based on our evaluation of TMC's proposed mitigation measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on the affected species or stocks and their habitat, with particular focus on rookeries, mating grounds, and similar areas of significance.

Proposed Monitoring and Reporting

To issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present while conducting the activities. Effective reporting is critical to both compliance and ensuring the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should help improve the understanding of one or more of the following:

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

• Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the activity; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);

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

• How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;

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

• Mitigation and monitoring effectiveness.

The monitoring and reporting requirements described in the following were proposed by TMC in its adequate and complete application TMC has agreed to the requirements. NMFS describes these below as requirements and has included them in the proposed.

TMC would abide by all monitoring and reporting measures contained within the IHA, if issued, and their Protected Species Monitoring Plans (see NMFS' website at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*).

At least two PSOs will be on duty during pile driving and at least three PSOs will be on-duty during DTH drilling and DTH anchoring. TMC would also employ one PSO during times when non-pile related in-water work is occurring. The locations of PSOs will be chosen based on site accessibility and field of vision and are designed to monitor to the maximum extent practicable. PSO locations include Harris Harbor (Station 1), on the beach in front of the Juneau Seawalk (Station 2), Coast Guard dock (Station 3), and

Sheep Creek Beach and Fishing Area (Station 4). PSO scenarios are summarized in table 10.

Table 10 -- PSO Location Scenarios

Scenario	Activity	PSO Location	# of PSOs
1	non-pile related in-water construction	Station 2 or 4	1
2	vibratory or impact pile driving	Station 2 and 4	2
3	DTH drilling/anchoring	Station 1, 3 and 4	3

Monitoring would take place from 30 minutes prior to initiation of pile driving or removal and DTH activities through 30 minutes post-completion of pile driving activity. Monitoring would be conducted during periods of sufficient visibility for the lead PSO to determine that the clearance and shutdown zones indicated in table 10 are clear of marine mammals.

All PSOs must be NMFS-approved and have no other assigned tasks during monitoring periods. At least one PSO must have prior experience performing the duties of a PSO during the specified activities. At least two PSOs will be on duty during pile driving activities and at least three PSOs will be on-duty during DTH drilling and DTH anchoring. Where a team of three or more PSOs is required, a lead observer or monitoring coordinator would be designated. The lead observer must have prior experience working as a marine mammal observer during construction. Additional PSOs may be employed during periods of low or obstructed visibility to ensure the entirety of the shutdown zone is monitored.

TMC would submit a draft report on all construction activities and marine mammal monitoring results to NMFS within 90 days of the completion of monitoring, or 60 days prior to the requested issuance of any subsequent IHAs or similar activity at the same location, whichever comes first. TMC will provide a final report to NMFS within 30 days following resolution of NMFS’ comments on the draft report.

The information required to be collected and reported to NMFS is included in the draft IHA available at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*. In summary, the report would include, but not be limited to, information regarding activities that occurred, marine mammal sighting data, and whether mitigative actions were taken or could not be taken. TMC would also be required to submit reports on any observed injured or dead marine mammals. If the death or injury was clearly caused by a specified activity, the TMC would immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the IHA. TMC would not resume its activities until notified by NMFS.

Specific proposed monitoring, and reporting requirements can be found in the draft IHA found at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*.

Negligible Impact Analysis and Determination

NMFS defines negligible impact as an effect of the specified activity that cannot reasonably be expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the absence of likely adverse effects on annual recruitment or survival rates (*i.e.*, population-level effects). An estimate of the number of takes alone is insufficient to support an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any impacts or responses (*e.g.*, intensity, duration), the context of any impacts or responses (*e.g.*, critical reproductive time or location, foraging impacts affecting energetics), effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating them against population status. Consistent with the 1989 preamble to NMFS' implementing regulations (54 FR 40338, September 29, 1989), impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their effects on the baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, the following analysis applies to all species listed in table 8 given that the anticipated effects of TMC's activities on this different marine mammal stocks are expected to be similar. There is little information on the nature or severity of the impacts, or on the size, status, or structure of any of these species or stocks, which would lead to a different analysis for this activity.

Specifically, the specified activities may result in take, in the form of Level A harassment and/or Level B harassment, from underwater sounds generated from pile driving and removal. Potential takes could occur if individuals of these species are present in zones ensonified above the thresholds for Level A harassment and/or Level B harassment identified above when these activities are underway. TMC would implement mitigation measures designed to reduce the potential for and severity of harassment that effect the least practicable adverse impact on the affected marine mammal species and stocks during the specified activities. Given the nature of the proposed activities, NMFS does not anticipate serious injury or mortality due to TMC's specified activities, even in the absence of required mitigation.

For all species and stocks, take is expected to occur within a limited, confined area (adjacent to the project site) of the species' range, including Southeast Alaska. The intensity and duration of take by Level A harassment and/or Level B harassment would be minimized through the proposed mitigation measures described herein. Furthermore, the number of takes proposed for authorization is small compared to the relative stock's abundance, even assuming that every take for any particular species could wholly occur to individuals of an individual stock.

NMFS is proposing to authorize take, by Level A harassment, for four marine mammal species incidental to the specified activities. As described in the **Potential Effects to Marine Mammals and Their Habitat** section, the impacts could be a small degree of AUD INJ which may or may not manifest as PTS. Should PTS occur, at most, NMFS anticipates it would be of a small degree; therefore, NMFS anticipates a sound would have to be only slightly louder for it to be heard by an individual that may incur PTS from the project. Further, PTS would only occur within the frequency range of the source (*i.e.*, impact pile driving, DTH activities) which does not cover any species complete hearing range. For most species, the frequency range of the noise produced by the specified activities is outside their primary hearing range. While the noise sources most overlap with low frequency cetaceans, NMFS is proposing to authorize only 39 instances of AUD INJ for this hearing group.

Additionally, as noted previously, some subset of individuals who are behaviorally harassed during the activities could also simultaneously incur some small degree of TTS for a short duration. However, because of the anticipated small degree of possible overlap of sound exposure, duration, and hearing frequency with species occurrence, any TTS is expected to be limited.

Behavioral responses of marine mammals to pile removal and installation activities in the project area, if any, are expected to be mild, short-term, and temporary. Marine mammals within the Level B harassment zones may not show any visual cues that they are disturbed by activities, or they may become alert, avoid the area, leave the area, or display other mild responses that are not observable, such as changes in vocalization patterns. Additionally, many of the species present in the region would be present only temporarily, based on seasonal patterns or during active transit between other habitats.

Most likely, during the specified activities, individuals are expected to move away from the sound source until the source ceases. An avoidance response is most likely to occur if an animal is in close proximity to a source, most notably impact pile driving, DTH drilling, and DTH anchoring. At distance, the severity of any behavioral response is likely to be diminished from all of the specified activities. It is possible that avoidance or other behavioral responses do not occur, especially for non-impulsive sources such as vibratory pile removal and driving, given marine mammals in the Juneau area are consistently exposed to anthropogenic noise sources like vessel traffic. Regardless, NMFS conservatively assumes animals disturbed by project sounds would be expected to avoid the area and use nearby higher-quality habitats. Further, pinnipeds in the area would be able to haul out to avoid underwater noise exposure.

The potential for all harassment is minimized by implementing the proposed mitigation measures. During all pile removal and installation activities, TMC would delay commencement of or shutdown activities if a marine mammal is observed within designates zones to minimize instance and severity of behavioral harassment and injury. These zones would be monitored by NMFS-approved PSOs. Further, prior to impact pile driving, TMC will implement a soft-start of the equipment prior to operating at maximum energy. Given sufficient notice through soft start, marine mammals are expected to move away from a sound source to avoid the loudest noise exposure; thereby, reducing the intensity of any behavioral reactions or injury that may occur.

Any impact on marine mammal habitat, including prey, from TMC's proposed activities would primarily have temporary effects primarily resulting in increased turbidity and avoidance of the immediate vicinity around the project site by prey. Addition of the new dock would result in permanent impacts; however, these and the expected temporary impacts are not expected to adversely affect the degree to which marine mammals can efficiently forage.

In summary, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect any of the species or stocks through effects on annual rates of recruitment or survival:

- No mortality or serious injury is anticipated or proposed for authorization, and no Level A harassment (AUD INJ) is anticipated or proposed for authorization incidental to the Aak'w Landing Development Project;
- Any Level A harassment (AUD INJ) is anticipated to be slight AUD INJ, including slight PTS of a few decibels within the lower frequencies associated with pile driving and not encompassing a species' full hearing range;
- The anticipated incidents of Level B harassment would result in, at worst, temporary modifications in behavior or a small degree of TTS that would resume to baseline at the cessation of activities or as animals move away from the source;
- The project area is located in a highly industrialized and commercial bay; therefore, species taken are likely acclimated to anthropogenic activities and behavioral reactions are expected to be minor (if at all);
- Take could occur within a very small area affected by the specified activity relative to the overall habitat ranges of all species, does not include any rookeries nor ESA-designated critical habitat;
- Effects on species that serve as prey for marine mammals from the activities are primarily expected to be short-term and, therefore, any associated impacts on marine mammal feeding are not expected to result in significant or long-term consequences for individuals, or to accrue adverse impacts on their populations;
- The proposed mitigation measures, such as soft-starts and shutdowns, are expected to reduce the effects of the specified activity to the least practicable adverse impact level; and

- TMC would employ NMFS-approved PSOs to monitor for marine mammals and call for implementation of applicable mitigation measures; TMC would report PSO observations to NMFS.

Based on the analysis contained herein of the likely effects of the specified activities on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the specified activities would have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted previously, only take of small numbers of marine mammals may be authorized under section 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers, so, in practice, when estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate abundance estimate for the relevant species or stock in determining whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is fewer than one-third of the species or stock abundance, the take is considered to be of small numbers (see 86 FR 5322, January 19, 2021). Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The percentage of the population that may be harassed incidental to the specified activities assuming each take is of a different individual is provided in table 8. The total amount of take proposed to be authorized is less than one-third for 9 of the 10 stocks impacted (see table 8). The total number of takes proposed to be authorized for the Lynn Canal/St. Stephens Passage stock of harbor seals is approximately 44 percent of the total stock abundance estimate (13,388), assuming each take is to a different individual (*i.e.,* no repeated takes to the same individual). However, it is likely that a relatively small subset of harbor seals would be incidentally harassed repeatedly by the specified activities, and therefore, the number of individuals taken is likely less than one-third of our stock. The stock range extends over approximately 4500 km^2 and harbor seals are known to exhibit residency patterns such that repeated exposures are a likely outcome. Overall, NMFS anticipates this percentage to be lower than provided in table 8 for most species as repeated takes of individuals is likely to occur given known persistence in the area, particularly for pinnipeds.

Based on the analysis contained herein of the proposed activities (including the proposed mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS preliminarily finds that small numbers of marine mammals would be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

In order to issue an IHA, NMFS must find that the specified activity will not have an "unmitigable adverse impact" on the subsistence uses of the affected marine mammal species or stocks by Alaskan Natives. NMFS has defined "unmitigable adverse impact" in 50 CFR 216.103 as an impact resulting from the specified activity: (1) that is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (i) causing the marine mammals to abandon or avoid hunting areas; (ii) directly displacing subsistence users; or (iii) placing physical barriers between the marine mammals and the subsistence hunters; and (2) that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

Alaska Natives have traditionally harvested subsistence resources, including sea lions and harbor seals, in Southeast Alaska. Since surveys of harbor seal and sea lion subsistence harvest in Alaska began in 1992, there have been declines in the number of households hunting and harvesting pinnipeds in Southeast Alaska while the number of household hunting and harvesting sea lions has remained relatively constant at low levels (Wolfe *et al.*, 2013). Subsistence harvest data for the Lynn Canal/Stephens Passage stock indicates an average annual harvest in the years 2004-2008 of 69 harbor seals; in 2011, 42 seals were harvested, and 24 seals were harvested in 2012 (summarized in Muto *et al.*, 2016 from Wolfe *et al.*, 2013). In 2012, the community of Juneau had an estimated subsistence take of zero Steller sea lion (Wolfe *et al.*, 2013).

The Alaska Department of Fish and Game has designated the area around Juneau, including ensonified waters from the project, a non-subsistence area which is defined as an area where dependence upon subsistence (customary and traditional uses of fish and wildlife) is not a principal characteristic of the economy, culture, and way of life (AS 16.05.258(c)). Regardless, the impact of the project on marine mammals is expected to be primarily limited to mild behavioral reactions such as temporary avoidance during pile activities, increased swim speeds, cessation of vocalizations such that it would not affect their availability for subsistence use.

TMC's application indicates that in June 2025, they contacted various tribal entities including the Central Council of the Tlingit and Haida Indian Tribes of Alaska, the Douglas Indian Association, and the Bureau of Indian Affairs without response.

Given all this information, NMFS has preliminarily determined that authorizing the take requested by TMC is not likely to adversely affect the availability of any marine mammal species/stocks that would traditionally be used for subsistence purposes, or would affect any subsistence harvest.

- The proposed construction activities are spatially localized within an existing waterfront development wherein marine mammals have become acclimated to human activity;
- The proposed activities are temporary in nature;

- TMC would implement mitigation measures that minimize any harassment to marine mammals in the action area, including traditionally harvested species;
- NMFS expects that most of the effects on marine mammals would not rise above behavioral impacts (*i.e.*, Level B harassment) and would be temporary in nature and any AUD INJ (*i.e.*, Level A harassment) that may occur would be a slight threshold shift and would be limited to a few instances of take; and
- No serious injury or mortality is expected or proposed to be authorized.

For these reasons, NMFS has preliminarily determined that there will not be an unmitigable adverse impact on subsistence uses from authorizing the requested take that may occur incidental to TMC's specified activities.

Endangered Species Act

Section 7(a)(2) of the ESA of 1973 (16 U.S.C. 1531 *et seq*.) requires that each Federal agency ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance in issuing an ITA, NMFS consults internally whenever we propose to authorize take of ESA-listed species, in this case with the NMFS Alaska Regional Office (AKRO).

NMFS is proposing to authorize the take of the Mexico-North Pacific stock of humpback whales and western stock of Steller sea lions, which are listed under the ESA. The NMFS Office of Protected Resources has requested the initiation of ESA section 7 consultation with AKRO for the issuance of this IHA. NMFS would conclude the ESA consultation before reaching a determination regarding the issuance of the proposed IHA.

Proposed Authorizations

As a result of these preliminary determinations, NMFS proposes to issue an IHA to TMC provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA can be found at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*.

Request for Public Comments

We request comments on our analyses, the proposed authorization, and any other aspect of this notice. We also request comments on the potential renewal of the IHA, if issued, as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform decisions on the request for these IHA or a subsequent IHA renewal.

On a case-by-case basis, NMFS may issue a one-time, 1-year renewal IHA following notice to the public providing an additional 15 days for public comments when (1) up to another year of identical or nearly identical activities as described in the **Description of Proposed Activity** section of this notice is planned or (2) the activities as described in the **Description of Proposed Activity** section of this notice would not be completed by the time the IHA expires and a renewal would allow for completion of the activities beyond that described in the *Dates and Duration* section of this notice, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to the needed renewal IHA effective date (recognizing that the renewal IHA expiration date cannot extend beyond 1 year from expiration of the initial IHA). The request for renewal must include (1) an explanation that the activities to be conducted under the requested renewal IHA are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.*, reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take); and (2) a preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized; and

- Upon review of the request for renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: April 13, 2026.

Kimberly Damon-Randall,

Director, Office of Protected Resources,

National Marine Fisheries Service.

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