DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

XRIN 0648–XE941

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Kodiak Transient Float Replacement Project

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 an application from the City of Kodiak Port and Harbors (the City) for an Incidental Harassment Authorization (IHA) to take marine mammals, by harassment, incidental to the Kodiak transient float replacement project in Kodiak, Alaska. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an IHA to the City to incidentally take, by Level B Harassment only, marine mammals during the specified activity. The City requests that the IHA be valid for one year, from January 1, 2017 through December 31, 2017. Pursuant to NEPA, NMFS is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) and will consider comments submitted in response to this notice as part of that process. The EA will be posted at *http://www.nmfs.noaa.gov/pr/permits/incidental/construction.htm* once it is finalized.

DATES: Comments and information must be received no later than December 12, 2016.

ADDRESSES: Comments on the application should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910. The mailbox address for providing email comments is *itp.mccue@noaa.gov.* Comments sent via email, including all attachments, must not exceed a 25-megabyte file size. NMFS is not responsible for comments sent to addresses other than those provided here.

Instructions: All comments received are a part of the public record and will generally be posted to *http://www.nmfs.noaa.gov/pr/permits/incidental.htm* without change. All Personal Identifying Information (for example, name, address, etc.) voluntarily submitted by the commenter may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information.

An electronic copy of the application may be obtained by writing to the address specified above, telephoning the contact listed below (see **FOR FURTHER INFORMATION CONTACT**), or visiting the internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental/.* The following associated documents are also available at the same internet address: Draft EA, Monitoring Plan. Documents cited in this notice may also be viewed, by appointment, during regular business hours, at the aforementioned address.

FOR FURTHER INFORMATION CONTACT: Laura McCue, Office of Protected Resources, NMFS, (301) 427–8401.

SUPPLEMENTARY INFORMATION:

Availability

An electronic copy of the City's application and supporting documents, as well as a list of the references cited in this document, may be obtained by visiting the Internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental/construction.htm.* In case of problems accessing these documents, please call the contact listed above.

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce 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 issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

An authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth. NMFS has defined ''negligible impact'' in 50 CFR 216.103 as ''an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.''

Except with respect to certain activities not pertinent here, 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 causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Summary of Request

On August 15, 2016, NMFS received an application from the City for the taking of marine mammals incidental to the Kodiak transient float replacement project in Kodiak, Alaska. On October 17, 2016 NMFS received a revised application with updated take numbers. NMFS determined that the application was adequate and complete on October 21, 2016. Subsequent to NMFS accepting the application, changes were made to the injury zones, take numbers, and shutdown zones. The City provided a memo to NMFS on November 1, 2016 noting these changes.

The City proposes to conduct in-water construction work (*i.e.,* pile driving and removal) that may incidentally harass marine mammals. The proposed activity would occur from January 1, 2017 through December 31, 2017, with restrictions on impact driving between May 1, 2017 and June 30, 2017.

Proposed activities included as part of the Kodiak transient float replacement project (transient float project) with the potential to take marine mammals include vibratory and impact pile-driving operations and use of a down-hole drill/hammer to install piles in bedrock. Take by Level B harassment of individuals of six species is anticipated to result from the specified activity.

On August 4, 2016, NMFS released its Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Guidance). This new guidance established new thresholds for predicting auditory injury, which equates to Level A harassment under the MMPA. The transient float project used this new guidance when determining the injury (Level A) zones.

Description of the Specified Activity

Overview

The City proposes to replace its existing transient float located in Kodiak's Near Island Channel. The purpose of this project is to replace the transient float with one that meets modern standards for vessel mooring and public safety for the next 50 years. The existing float has structural issues due to failing walers, stringers, and bullrails. Due to these structural problems, the float's capacity has been reduced. The existing float needs to be replaced due to its poor condition and reduced capacity. The proposed action includes in-water construction, including the removal of the existing timber float and its associated timber and steel piles, and installation of the replacement float and steel piles. The replacement float will be located within nearly the same footprint as the existing facility; however, the overall float length will be shortened to improve all around accessibility within City right-of-way limits.

Dates and Duration

Pile installation and extraction associated with the Kodiak transient float replacement project is scheduled to begin in January 2017 and end in March 2017. Pile installation and removal will take approximately 57 hours and is expected to take place over a period of 12 days (not necessarily consecutive days). To minimize impacts to pink salmon fry (*Oncorhynchus gorbuscha*) and coho salmon smolt (*O. kisutch*), all in-water pile extraction and installation is planned to be completed by April 30, 2016. However, if work cannot be completed by that date, the Alaska Department of Fish & Game (ADF&G) has recommended that the City refrain from impact pile installation from May 1 through June 30 within the 12-hour period beginning daily at the start of civil dawn (Marie 2015). If impact pile-driving occurs from May 1 through June 30, it will occur in the evenings during daylight hours, after the end of the 12-hour period that begins at civil dawn.

The 2.5-month long construction period accounts for the time required to mobilize materials and resources, remove and replace piles, remove the existing float, and install the new float, abutment, gangway, electrical components, and other safety features. The 2.5-month long construction period also accounts for potential delays in material deliveries, equipment maintenance, inclement weather, and shutdowns that could occur if marine mammals come within disturbance zones associated with the project area. However, the City has requested an authorization for up to one year of construction activities in case unforeseen construction delays occur.

Pile extraction, pile driving, and drilling will occur intermittently over the work period, from minutes to hours at a time (Table 1 in the City's application). The proposed transient float replacement project will require an estimated 12 days total of pile extraction and installation, including eight hours of vibratory extraction and installation, 48 hours of down-hole drilling, and less than one hour of impact hammering. Timing will vary based on the weather, delays, substrate type (the rock is layered and is of varying hardness across the site, so some holes will be drilled quickly and others may take longer), and other factors.

Specified Geographic Region

The Kodiak transient float is located in the City of Kodiak, Alaska, at 57.788162° N., −152.400287° W., in Near Island Channel in the Gulf of Alaska (See Figures 1–3 in the City's Application). The transient float provides moorage for vessels from villages as well as from the commercial fishing fleet located in Near Island Channel, which separates downtown Kodiak from Near Island (Figure 1–2 in the City's application). The channel is approximately 200 meters (m) (656 feet (ft)) wide and 15 m (50 ft) deep in the project area. In the project footprint, the shoreline along the Transient Float is heavily armored with riprap (see Figure 4 of the City's application) and impervious surfaces directly abut the shoreline adjacent to the float. The channel is located within Chiniak Bay which opens to the Gulf of Alaska.

The proposed project is located in a busy industrial area (Figure 3 of the City's application). Channel Side Services' seafood packing facility is located approximately 25 m (82 ft) east of the float and Petro Marine Services floating fuel dock is located approximately 20 m (66 ft) west of the float. Pier 1, the Alaska Marine Highway Ferry dock, is located 100 m (328 ft) southwest of the float and Trident Seafood's shore-based seafood processing plant is located approximately 175 m (574 ft) to the southwest (See Figure 3 in the City's application). When in operation, Trident's plant receives numerous commercial fishing vessels daily for offloading and processing of catch.

Detailed Description of Activities

The proposed action for this IHA request includes in-water construction, including the removal of the existing timber float and its associated steel piles (19 12-inch steel piles), and installation of the replacement float and steel piles (12 24-inch steel piles). The replacement float will be located within nearly the same footprint as the existing facility; however, the overall float length will be shortened to improve all around accessibility within City right-of-way limits. The proposed transient float project will require an estimated 57 hours over 12 days total of pile extraction and installation, including approximately eight hours of vibratory extraction and installation, 48 hours of down-hole drilling, and less than one hour of impact hammering. In water construction activities are expected to occur over 2.5 months.

While work is conducted in the water, anchored barges would be used to stage construction materials and equipment. The existing piles, fixed pier, float and gangway will be removed and disposed of properly and the new float will be installed.

It is estimated that it will take 10 minutes of vibratory pile-driving and four hours of down-hole drilling per pile for installation, and 20 minutes of vibratory pile-driving per pile for extraction. For the installation of 12 piles, this is an estimated two hours of total time using active vibratory equipment and 48 hours of total time using down-hole drilling. For the in-water extraction of 19 piles, this is an estimated 6.33 hours of total time using active vibratory equipment. Two piles would remain in place, and two piles to be removed are above the high tide line. No temporary piles are associated with this project.

The 24-inch steel piles will be driven 3–4.6 m (10–15 ft) through sediment and drilled another 3 m (10 ft) into bedrock. The sequence for installing the 24-inch piles will begin with insertion through overlying sediment with a vibratory hammer for about eight minutes per pile. Next, a hole will be drilled in the underlying bedrock by using a down-hole drill. A down-hole drill is a drill bit that drills through the sediment and a pulse mechanism that functions at the bottom of the hole, using a pulsing bit to break up the harder materials or rock to allow removal of the fragments and insertion of the pile. The head extends so that the drilling takes place below the pile. Drill cuttings are expelled from the top of the pile as dust or mud. It is estimated that drilling piles through the layered bedrock will take about four hours per pile. Finally, the vibratory hammer will be used again to finish driving the piles into bedrock, for approximately two minutes per pile (Table 1).

Although impact pile-driving is not expected for this project, the contractor may choose to impact proof the piles after down-hole drilling. In this case, two to five blows of an impact hammer would be used to confirm that piles are set into bedrock, for an expected maximum time of three minutes of impact hammering per pile. When the impact hammer is employed for proofing, a pile cap or cushion will be placed between the impact hammer and the pile.

TABLE 1—ESTIMATED NUMBER OF HOURS PROPOSED FOR PILE EXTRACTION AND INSTALLATION

Pile type, location, method	Number of piles	Vibratory hammer		Down-hole drill		Impact hammer	
		Number of piles	Hours	Number of piles	Hours	Number of piles	Hours
12-inch Steel Existing Float Extraction	19	19	6.33	0	0	0	0
24-inch Steel Replacement Float Installation	12	12	2	12	48	12	0.6
Total hours in-water			8.33		48		0.6

Description of Marine Mammals in the Area of the Specified Activity

Marine waters near Kodiak Island support many species of marine mammals, including pinnipeds and cetaceans; however, the number of species regularly occurring near the project area is limited. Steller sea lions (*Eumatopias jubatus*) are the most common marine mammals in the project area and are part of the western Distinct Population Segment (wDPS) that is listed as endangered under the Endangered Species Act (ESA). Harbor seals (*Phoca vitulina*), harbor porpoises (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), killer whales (*Orcinus orca*), and humpback whales (*Megaptera novaeangliae*) may also occur in the project area, especially in the waters between Near Island Channel and Woody Island, but far less frequently and in lower abundance than Steller sea lions. Fin whales (*Balaenoptera physalus*) and grey whales (*Eschrichtius robustus*) occur in the nearshore waters around Kodiak Island, but are not expected to be found near the project area because of the narrow channel and high level of boat traffic. The relatively large numbers of Steller sea lions in the area may serve as an additional deterrent for some marine mammals. Table 2 provides information about the species that are potentially present in the project area. This notice of proposed authorization assesses the potential impacts to Steller sea lion, harbor seal, harbor porpoise, Dall's porpoise, killer whale, and humpback whale, which are the species that regularly occur or that may occur in the project area.

In the species accounts provided here, we offer a brief introduction to the species and relevant stock as well as available information regarding population trends and threats, and describe any information regarding local occurrence.

TABLE 2—MARINE MAMMAL SPECIES POTENTIALLY PRESENT IN THE PROJECT AREA

Species	Stock	ESA/ MMPA status; strategic (Y/N) [1]	Stock abundance (CV, N_{min}, most recent abundance survey) [2]	PBR [3]	Relative occurrence in Kodiak
Order Cetartiodactyla—Cetacea—Superfamily Odontoceti (toothed whales, dolphins, and porpoises) Family Phocoenidae (porpoises)					
Dall's porpoise.	Alaska	–: N	83,400 (0.097; n/a; 1993)	Undet	Rare.
Harbor porpoise.	Gulf of Alaska	–: S	31,046 (n/a; n/a; 2010)	Undet	Common.
Order Cetartiodactyla—Cetacea—Superfamily Odontoceti (toothed whales, dolphins, and porpoises) Family Delphinidae (dolphins)					
Killer whale	Eastern North Pacific Alaska Resident	–: N	2,347 (n/a; 2,347; 2012)	23.4	Common.
	Eastern North Pacific Gulf of AK, Aleutian Islands, and Bering Sea Transient.	–: N	587 (n/a; 587; 2012)	5.9	Common.
Order Cetartiodactyla—Cetacea—Superfamily Odontoceti (toothed whales, dolphins, and porpoises) Family Balaenopteridae					
Humpback whale.	Central North Pacific	n/a [4]; S	10,103 (0.300; 7,890; 2006)	83	Rare.
	Western North Pacific	n/a [4]; S	1,107 (0.300; 865; 2006)	3	Rare.
Fin whale	Northeast Pacific	E/D; S	n/a (n/a; n/a; 2010)	undet	Rare.
Order Cetartiodactyla—Cetacea—Superfamily Odontoceti (toothed whales, dolphins, and porpoises) Family Eschrichtiidae					
Grey whale	Eastern North Pacific	–:N	20,990 (0.05; 20,125; 2011)	624	Rare.

TABLE 2—MARINE MAMMAL SPECIES POTENTIALLY PRESENT IN THE PROJECT AREA—Continued

Species	Stock	ESA/MMPA status; strategic (Y/N) [1]	Stock abundance (CV, N_{min}, most recent abundance survey) [2]	PBR [3]	Relative occurrence in Kodiak
Order Carnivora—Superfamily Pinnipedia Family Otariidae (eared seals and sea lions)					
Steller sea lion.	wDPS	E/D; S	49,497 (n/a; 49,497; 2014)	297	Common.
Order Carnivora—Superfamily Pinnipedia Family Phocidae (earless seals)					
Harbor seal	South Kodiak	–; N	19,199 (n/a; 17,479; 2011)	314	Common.

[1] 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 (see footnote 3) or which 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 under the MMPA as depleted and as a strategic stock.

[2] CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance. In some cases, CV is not applicable. For certain stocks of pinnipeds, abundance estimates are based upon observations of animals (often pups) ashore multiplied by some correction factor derived from knowledge of the species' (or similar species') life history to arrive at a best abundance estimate; therefore, there is no associated CV. In these cases, the minimum abundance may represent actual counts of all animals ashore.

[3] Potential biological removal, defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population size (OSP).

[4] The newly defined DPSs do not currently align with the stocks under the MMPA.

Cetaceans

Harbor Porpoise

The harbor porpoise inhabits temporal, subarctic, and arctic waters. In the eastern North Pacific, harbor porpoises range from Point Barrow, Alaska, to Point Conception, California. Harbor porpoise primarily frequent coastal waters and occur most frequently in waters less than 100 m deep (Hobbs and Waite 2010). They may occasionally be found in deeper offshore waters.

In Alaska, harbor porpoises are currently divided into three stocks, based primarily on geography. These are the Bering Sea stock, the Southeast Alaska stock, and the Gulf of Alaska stock (Allen and Angliss 2015). Only the Gulf of Alaska stock is considered in this application because the other stocks are not found in the geographic area under consideration.

Harbor porpoises are neither designated as depleted under the MMPA nor listed as threatened or endangered under the ESA. Because the most recent abundance estimate is 14 years old and information on incidental harbor porpoise mortality in commercial fisheries is not well understood, the Gulf of Alaska stock of harbor porpoise is classified as strategic. Population trends and status of this stock relative to optimum sustainable population size are currently unknown with an undetermined PBR. The Gulf of Alaska stock is currently estimated at 31,046 individuals (Allen and Angliss 2015). No reliable information is available to determine trends in abundance.

According to the online database Ocean Biogeographic Information System, Spatial Ecological Analysis of Megavertebrate Populations (OBIS–SEAMAP), West Coast populations have more restricted movements and do not migrate as much as East Coast populations. Most harbor porpoise groups are small, generally consisting of less than five individuals (Halpin 2009 at OBIS–SEAMAP 2016). Harbor porpoise in Southeast Alaska are usually found in groups of one or two individuals (Dahlheim 2009, 2015).

Harbor porpoises commonly frequent Kodiak's nearshore waters, but are rarely if ever noted in the Kodiak channel (K. Wynne, pers. comm.). Harbor porpoises are expected to be encountered rarely in the project area. During the Kodiak ferry terminal reconstruction project, six sightings of singles or pairs of harbor porpoise were seen during 110 days of monitoring (ABR 2016).

Dall's Porpoise

Dall's porpoise are widely distributed in the North Pacific Ocean, usually in deep oceanic waters (>2,500 m) or over the continental shelf or along slopes (Muto *et al.,* 2015). They are present throughout the entire year. The stock structure of eastern North Pacific Dall's porpoise is not adequately understood at this time; therefore, only one stock is recognized in Alaskan waters: The Alaska stock (Muto *et al.,* 2015).

The Alaska stock of Dall's porpoise has an abundance estimate of 83,400 individuals based on surveys from the early 1990s. However, this data is unreliable because it is over eight years old. Information on PBR and population trends are not currently available (Muto *et al.*, 2015). Dall's porpoise are not designated as depleted or classified as strategic under the MMPA, nor are they listed under the ESA (Muto *et al.*, 2015). The main threat to this species is habitat modification from climate change and urban/industrial development (Muto *et al.,* 2015). Average group size for Dall's porpoise in Southeast Alaska is three individuals (Dahlheim 2009). The OBIS SEAMAP Web site states that this species forms small groups of between two and 12 individuals (Halpin 2009 at OBIS–SEAMAP 2016).

Dall's porpoise are considered uncommon in the action area, except in the narrow channel between Woody Island and Near Island Channel where the waters may be deeper. No Dall's porpoise were observed in the Near Island Channel during a recent project at the nearby Kodiak ferry terminal over 110 days of monitoring (ABR 2016).

Killer Whale

Killer whales have been observed in all oceans and seas of the world, but the highest densities occur in colder and more productive waters found at high latitudes (Muto *et al.,* 2015). Killer whales are found throughout the North Pacific, and occur along the entire Alaska coast, in British Columbia and Washington inland waterways, and along the outer coasts of Washington, Oregon, and California (Muto *et al.,* 2015).

Based on data regarding association patterns, acoustics, movements, and genetic differences, eight killer whale stocks are now recognized within the Pacific U.S. Exclusive Economic Zone, seven of which occur in Alaska: (1) The Alaska Resident stock; (2) the Northern Resident stock; (3) the Southern Resident stock; (4) the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock; (5) the AT1 Transient stock; (6) the West Coast transient stock, occurring from California through southeastern Alaska; and (7) the Offshore stock. Only the Alaska Resident stock and the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock are considered in this application because other stocks occur outside the geographic area under consideration.

The Alaska Resident stock occurs from southeastern Alaska to the Aleutian Islands and Bering Sea. Although the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock occupies a range that includes all of the U.S. Exclusive Economic Zone in Alaska, few individuals have been seen in southeastern Alaska. The transient stock occurs primarily from Prince William Sound through the Aleutian Islands and Bering Sea.

The Alaska Resident stock of killer whales is currently estimated at 2,347 individuals, and the estimate of the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock is 587 individuals (Muto *et al.,* 2015). The abundance estimate for the Alaska Resident stock is likely underestimated because researchers continue to encounter new whales in the Gulf of Alaska and western Alaskan waters. At present, reliable data on trends in population abundance for both stocks are unavailable.

Transient killer whales are seen periodically in waters of Kodiak Harbor, with photo-documentation since at least 1993 (Kodiak Seafood and Marine Science Center 2015). One pod known to visit Kodiak Harbor includes an adult female and adult male that have distinctive dorsal fins that make repeated recognition possible. This, as well as their easy visibility from shore, has led to their ''popularity'' in Kodiak, where their presence is often announced on public radio. They have been repeatedly observed and photographed attacking Steller sea lions.

The Kodiak killer whales appear to specialize in preying on Steller sea lions commonly found near Kodiak's processing plants, fishing vessels, and docks. This pod kills and consumes at least four to six Steller sea lions per year from the Kodiak harbor area, primarily from February through May (Kodiak Seafood and Marine Science Center 2015, Wynne 2015b). Four pods, ranging from three to seven individuals, were observed during the Kodiak Ferry terminal reconstruction project over 110 days of monitoring, with animals staying between five minutes and five hours (ABR 2016). Further information on the biology and local distribution of these species can be found in the City's application available online at: *http://www.nmfs.noaa.gov/pr/permits/incidental/construction.htm* and the NMFS Marine Mammal Stock Assessment Reports, which may be found at: *http://www.nmfs.noaa.gov/pr/species/.*

Humpback Whale

Humpback whales are found worldwide in all ocean basins. In winter, most humpback whales occur in the subtropical and tropical waters of the Northern and Southern Hemispheres (Muto *et al.*, 2015). These wintering grounds are used for mating, giving birth, and nursing new calves. Humpback whales migrate nearly 3,000 mi (4,830 km) from their winter breeding grounds to their summer foraging grounds in Alaska.

There are five stocks of humpback whales, two of which occur in Alaska: The Central North Pacific Stock, which consists of winter/spring populations in the Hawaiian Islands which migrate primarily to northern British Columbia/Southeast Alaska, the Gulf of Alaska, and the Bering Sea/Aleutian Islands; and the Western North Pacific stock, which consists of winter/spring populations off Asia which migrate primarily to Russia and the Bering Sea/Aleutian Islands (Muto *et al.,* 2015). The Western North Pacific stock is found in coastal and inland waters around the Pacific Rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk and north of the Bering Strait, which are historical feeding grounds (Muto *et al.*, 2015). Information from a variety of sources indicates that humpback whales from the Western and Central North Pacific stocks mix to a limited extent on summer feeding grounds ranging from British Columbia through the central Gulf of Alaska and up to the Bering Sea (Muto *et al.*, 2015).

The current abundance estimate for the Central North Pacific stock is 10,103 animals, with PBR at 83 animals, and it is considered a strategic stock (Muto *et al.*, 2015). The current abundance estimate for the Western North Pacific stock is 1,107 animals, with PBR at 3 animals, and it is also considered a strategic stock (Muto *et al.*, 2015).

In the Gulf of Alaska, high densities of humpback whales are found in the Shumagin Islands, south and east of Kodiak Island, and from the Barren Islands through Prince William Sound. Although densities in any particular location are not high, humpback whales are also found in deep waters south of the continental shelf from the eastern Aleutians through the Gulf of Alaska.

Humpback whales were listed as endangered under the Endangered Species Conservation Act (ESCA) in June 1970. In 1973, the ESA replaced the ESCA, and humpbacks continued to be listed as endangered. NMFS recently evaluated the status of the species, and on September 8, 2016, NMFS divided the species into 14 distinct population segments (DPS), removed the current species-level listing, and in its place listed four DPSs as endangered and one DPS as threatened (NMFS 2016b, 81 FR 62259). The remaining nine DPSs were not listed. There are three DPSs that may occur in the action area: The Mexico DPS, the Hawaii DPS, and the Western North Pacific (WNP) DPS. The Hawaii DPS of humpback whales is not listed under the ESA, the Mexico DPS is listed as threatened, and the WNP DPS is listed as endangered (NMFS 2016b, 81 FR 62259). Because this rule resulted in the designation of DPSs in the North Pacific, a parallel revision of MMPA population structure in the North Pacific is currently being considered.

Of the humpback whales found in Alaska, it is estimated that 89 percent are from the Hawaii DPS, 10.5 percent are from the Mexico DPS, and 0.5 percent are from the WNP DPS (Wade *et al.*, 2016). The current abundance estimate for the Hawaii DPS is 11,398 individuals and is thought to be increasing with a population trend estimate of 5.5–6 percent (NMFS 2016b; 81 FR 62259). The current abundance estimate for the Mexico DPS is 3,264 individuals and the population trend is unknown (NMFS 2016b; 81 FR 62259). The current abundance estimate for the Western North Pacific DPS is 1,059 individuals, with an unknown trend (NMFS 2016b; 81 FR 62259).

Humpback whales are rarely seen in the action area, but occur in nearshore waters around Kodiak Island. One humpback whale was observed in Near Island Channel on one occasion in March 2016 during the Kodiak ferry terminal reconstruction project over 110 days of monitoring (ABR 2016).

Humpbacks may also be present in the channel between Woody Island and Near Island Channel where a narrow band may be ensonified from construction activities.

Pinnipeds

Steller Sea Lion

The Steller sea lion is the largest of the eared seals. Steller sea lion populations that primarily occur west of 144° W (Cape Suckling, Alaska) comprise the western Distinct Population Segment (wDPS). Only the wDPS is considered in this application because the eastern DPS (eDPS) occurs outside the geographic area under consideration. Steller sea lions were listed as threatened range-wide under the ESA on 26 November 1990 (55 FR 49204). Steller sea lions were subsequently partitioned into the western and eastern DPSs in 1997 (Allen and Angliss 2010), with the wDPS being listed as endangered under the ESA and the eDPS remaining classified as threatened (62 FR 24345) until it was delisted in November 2013.

The range of the Steller sea lion includes the North Pacific Ocean rim from California to northern Japan. Steller sea lions forage in nearshore and pelagic waters where they are opportunistic predators. They feed primarily on a wide variety of fishes and cephalopods. Steller sea lions use terrestrial haulout sites to rest and take refuge. They also gather on well-defined, traditionally used rookeries to pup and breed. These habitats are typically gravel, rocky, or sand beaches; ledges; or rocky reefs (Allen and Angliss 2013).

The wDPS of Steller sea lions declined approximately 75 percent from 1976 to 1990. Factors that may have contributed to this decline include (1) incidental take in fisheries, (2) legal and illegal shooting, (3) predation, (4) contaminants, (5) disease, and (6) climate change. Non-pup Steller sea lion counts at trend sites in the wDPS increased 11 percent during 2000–2004. These counts were the first region-wide increases for the wDPS since standardized surveys began in the 1970s, and were due to increased or stable counts in all regions except the western Aleutian Islands. During 2004–2008, western Alaska non-pup counts increased only three percent; eastern Gulf of Alaska (Prince William Sound area) counts were higher; counts from the Kenai Peninsula through Kiska Island, including Kodiak Island, were stable; and western Aleutian counts continued to decline (Allen and Angliss 2010). Steller sea lions have a worldwide population estimated at 120,000 to 140,000 animals, with approximately 93,000 in Alaska. The most recent comprehensive estimate for abundance of the wDPS in Alaska is 49,497 sea lions, based on aerial and land-based surveys conducted in 2013–2014 (Muto *et al.*, 2015). Steller sea lions are the most obvious and abundant marine mammals in the project area.

On 27 August 1993, NMFS published a final rule designating critical habitat for the Steller sea lion as a 20 nautical mile (nmi) buffer around all major haul-outs and rookeries, as well as associated terrestrial, air and aquatic zones, and three large offshore foraging areas (NMFS 1993; 50 CFR 226.202). The major natural Steller sea lion haulouts closest to the project area are located on Long Island and Cape Chiniak, which are approximately 4.6 nmi (8.5 kilometers (km)) and 13.8 nmi (25.6 km) away from the project site, respectively. Annual counts averaged 33 animals on Long Island from 2008 through 2010, and 119 animals at Cape Chiniak during the same time period (Table 4–1 in the City's application). The closest rookery is located on Marmot Island, approximately 30 nmi (55.5 km) from the project site, which had average annual counts of 656 animals from 2008 through 2010 (*as cited in* NMFS 2013). Critical habitat is associated with breeding and haulout areas in Alaska, California, and Oregon (NMFS 1993).

Many individual sea lions have become habituated to human activity in the Kodiak harbor area and utilize a man-made haulout float called Dog Bay float located in St. Herman Harbor, about 1,300 m (4,300 feet) from the project site (See Figure 1–2; Figure 3–1 in the application). A section from an old floating breakwater, the float was relocated to Dog Bay in the year 2000 and was intended to serve as a dedicated sea lion haulout. It serves its purpose of reducing sea lion-human conflicts in Kodiak's docks and harbors by providing an undisturbed haulout location and reducing the numbers of sea lions that haul out on vessel moorage floats. However, the float is not a federally recognized haulout and is not considered part of sea lion critical habitat.

Counts of sea lions hauled out on the Dog Bay float may provide an index of the number of Steller sea lions in the harbor area. Because this float is not considered an official haulout by NMFS, few standardized surveys to count sea lions have been conducted (Wynne 2015a). Surveys from 2004 through 2006 indicated peak winter (October–April) counts ranging from 27 to 33 animals (Wynne *et al.*, 2011). Counts from February 2015 during a site visit by biologists for the Pier 1 Kodiak Ferry Terminal and Dock Improvements Project ranged from approximately 28 to 45 sea lions on the float. More than 100 sea lions were counted on the Dog Bay float at times in spring 2015, although the mean number was much smaller (Wynne 2015b).

Abundant and predictable sources of food for sea lions in the Kodiak area include fishing gear, fishing boats and tenders, and the many seafood processing facilities that accept transfers of fish from offloading vessels. Sea lions have become accustomed to depredating fishing gear and raiding fishing vessels during fishing and offloading and they follow potential sources of food around the harbors and docks, waiting for opportunities to feed. When vessels are offloading fish at the docks of processing facilities, the sea lions rear out of the water to look over the gunnels for fish on the deck; if the vessel is a stern trawler, they charge up the stern ramp or codend to gain access to the deck (Speckman 2015; Ward 2015; Wynne 2015a).

The number of sea lions in the immediate project area varies depending on the season and presence of commercial fishing vessels unloading their catch at the seafood processing plant dock immediately adjacent to Pier 1, approximately 100 m from the transient float. During the February 2015 Pier 1 site visit by HDR biologists, from zero up to about 25 sea lions were seen at one time in the Pier 1 project area. About 22 of those sea lions were subadults that were clearly foraging on schooling fishes in the area and were not interacting with the fishing vessels offloading at the seafood processing plant at the time. A stern trawler offloading at the processing plant dock during this period was attended by three mature bull sea lions, which constantly swam back and forth behind the stern watching for an opportunity to gain access.

At least four other seafood processing facilities are present in Kodiak and operate concurrently with the one located next to Pier 1. All are visited by sea lions looking for food, and all are successfully raided by sea lions with regularity (Wynne 2015a). Sea lions also follow and raid fishing vessels. The seafood processing facility adjacent to the Pier 1 project site is therefore not the only source of food for Kodiak sea lions that inhabit the harbor area. Furthermore, sea lions in a more ''natural'' situation do not generally eat every day, but tend to forage every 1–2 days and return to haulouts to rest between foraging trips (Merrick and

Loughlin 1997; Rehburg *et al.* 2009). Based on numbers at the Dog Bay float and sea lion behavior, it is estimated that about 40 unique individual sea lions likely pass by the project site each day (Speckman 2015; Ward 2015; Wynne 2015a). Sea lions in the Kodiak harbor area are habituated to fishing vessels and are skilled at gaining access to fish. It is likely that some of the same animals follow local vessels to the nearby fishing grounds and back to town. It is also likely that hearing-impaired or deaf sea lions are among the sea lions that attend the seafood processing facilities. It is not known how a hearing-impaired or deaf sea lion would respond to typical mitigation efforts at a construction site such as ramping up of pile-driving equipment. It is also unknown whether a hearing-impaired or deaf sea lion would avoid pile-driving activity, or whether such an animal might approach closely, without responding to or being impacted by the noise level.

Harbor Seal

Harbor seals range from Baja California north along the west coasts of Washington, Oregon, California, British Columbia, and Southeast Alaska; west through the Gulf of Alaska, Prince William Sound, and the Aleutian Islands; and north in the Bering Sea to Cape Newenham and the Pribilof Islands. Distribution of the South Kodiak stock extends from East Cape (northeast coast of Kodiak Island) south to South Cape (Chirikof Island), including Tugidak Island, and up the southwest coast of Kodiak Island to Middle Cape.

In 2010, harbor seals in Alaska were partitioned into 12 separate stocks based largely on genetic structure (Allen and Angliss 2010). Only the South Kodiak stock is considered in this application because other stocks occur outside the geographic area under consideration.

The current statewide abundance estimate for Alaskan harbor seals is 205,090, based on aerial survey data collected during 1998–2011 (Muto *et al.*, 2015). The abundance estimate for the South Kodiak stock is 19,199 (Muto *et al.*, 2015). Harbor seals have declined dramatically in some parts of their range over the past few decades, while in other parts their numbers have increased or remained stable over similar time periods.

A significant portion of the harbor seal population within the South Kodiak stock is located at and around Tugidak Island off the southwest of Kodiak Island. Sharp declines in the number of seals present on Tugidak were observed between 1976 and 1998. Although the number of seals on Tugidak Island has stabilized and shows some evidence of increase since the decline, the population in 2000 remained reduced by 80 percent compared to the levels in the 1970s (Jemison *et al.*, 2006). The current population trend for this stock is unknown.

Harbor seals haul out on rocks, reefs, beaches, and drifting glacial ice (Allen and Angliss 2014). They are non-migratory; their local movements are associated with tides, weather, season, food availability, and reproduction, as well as sex and age class (Allen and Angliss 2014; Boveng *et al.*, 2012; Lowry *et al.*, 2001; Swain *et al.*, 1996).

Although the number of harbor seals on eastern Kodiak haulouts has been increasing steadily since the early 1990s (Kodiak Seafood and Marine Science Center 2015), sightings are rare in the project area. Several harbor seals tagged at Uganik Bay (Northwest Kodiak Island) dispersed as far north as Anchorage and as far south as Chignik, but none were found near Kodiak (Kodiak Seafood and Marine Science Center 2015). Harbor seals are expected to be encountered occasionally in the project area. Harbor seals were occasionally observed during the Kodiak ferry terminal reconstruction project, with one seen in January 2016 and three observed in March 2016 (ABR 2016).

Potential Effects of the Specified Activity on Marine Mammals and Their Habitat

This section includes a summary and discussion of the ways that components, (*e.g.*, pile driving,) of the specified activity, including mitigation may impact marine mammals and their habitat. The *Estimated Take by Incidental Harassment* section later in this document will include a quantitative analysis of the number of individuals that are expected to be taken by this activity. The *Negligible Impact Analysis* section will include the analysis of how this specific activity will impact marine mammals and will consider the content of this section, the *Estimated Take by Incidental Harassment* section, and the *Proposed Mitigation* section to draw conclusions regarding the likely impacts of this activity on the reproductive success or survivorship of individuals and from that on the affected marine mammal populations or stocks. In the following discussion, we provide general background information on sound and marine mammal hearing before considering potential effects to marine mammals from sound produced by pile extraction, vibratory pile driving, impact pile driving, and down-hole drilling.

Description of Sound Sources

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz (Hz) or cycles per second. Wavelength is the distance between two peaks of a sound wave; lower frequency sounds have longer wavelengths than higher frequency sounds and attenuate (decrease) more rapidly in shallower water. Amplitude is the height of the sound pressure wave or the 'loudness' of a sound and is typically measured using the decibel (dB) scale. A dB is the ratio between a measured pressure (with sound) and a reference pressure (sound at a constant pressure, established by scientific standards). It is a logarithmic unit that accounts for large variations in amplitude; therefore, relatively small changes in dB ratings correspond to large changes in sound pressure. When referring to sound pressure levels (SPLs; the sound force per unit area), sound is referenced in the context of underwater sound pressure to 1 microPascal (μPa). One pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. The source level (SL) represents the sound level at a distance of 1 m from the source (referenced to 1 μPa). The received level is the sound level at the listener's position. Note that all underwater sound levels in this document are referenced to a pressure of 1 μPa and all airborne sound levels in this document are referenced to a pressure of 20 μPa.

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. Rms is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick 1983). Rms accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper, 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in all directions away from the source (similar to ripples on the surface of a pond), except in cases where the source is directional. The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound. Ambient sound is defined as environmental background sound levels lacking a single source or point (Richardson *et al.*, 1995), and the sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.*, waves, earthquakes, ice, atmospheric sound), biological (*e.g.*, sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.*, vessels, dredging, aircraft, construction). A number of sources contribute to ambient sound, including the following (Richardson *et al.*, 1995):

- Wind and waves: The complex interactions between wind and water surface, including processes such as breaking waves and wave-induced bubble oscillations and cavitation, are a main source of naturally occurring ambient noise for frequencies between 200 Hz and 50 kHz (Mitson 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Surf noise becomes important near shore, with measurements collected at a distance of 8.5 km from shore showing an increase of 10 dB in the 100 to 700 Hz band during heavy surf conditions.
- Precipitation: Sound from rain and hail impacting the water surface can become an important component of total noise at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times.
- Biological: Marine mammals can contribute significantly to ambient noise levels, as can some fish and shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz.
- Anthropogenic: Sources of ambient noise related to human activity include transportation (surface vessels and aircraft), dredging and construction, oil and gas drilling and production, seismic surveys, sonar, explosions, and ocean acoustic studies. Shipping noise typically dominates the total ambient noise for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly (Richardson *et al.*, 1995). Sound from identifiable anthropogenic sources other than the activity of interest (*e.g.*, a passing vessel) is sometimes termed background sound, as opposed to ambient sound.

The sum of the various natural and anthropogenic sound sources at any given location and time—which comprise ''ambient'' or ''background'' sound—depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10–20 dB from day to day (Richardson *et al.*, 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

The underwater acoustic environment at the ferry terminal is likely to be dominated by noise from day-to-day port and vessel activities. This is a highly industrialized area with high-use from small- to medium-sized vessels, and larger vessel that use the nearby major shipping channel. Ambient underwater sound was measured in Near Island Channel, approximately 100 m southwest and 900 m northeast of the Transient Float, in March 2016 during construction of the Pier 1 Kodiak Ferry Terminal and Dock Improvements Project. Measurements recorded highly variable sound pressure levels (SPLs), ranging from approximately 80 to 140 decibels referenced to one microPascal (dB re 1 μPa). Peaks ranging from approximately 130 to 140 dB re 1 μPa were produced by vessels passing near acoustic recorders (Warner and Austin 2016).

In-water construction activities associated with the project would include impact pile driving, vibratory pile driving and extraction, and down-hole drilling. The sounds produced by these activities fall into one of two general sound types: Pulsed and non-pulsed (defined in the following paragraphs). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.*, Ward, 1997 in Southall *et al.*, 2007). Please see Southall *et al.*, (2007) for an in-depth discussion of these concepts.

Pulsed sound sources (*e.g.*, explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (ANSI, 1986; Harris, 1998; NIOSH, 1998; ISO, 2003; ANSI, 2005) and occur either as isolated events or repeated in some succession. Pulsed sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features.

Non-pulsed sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or non-continuous (ANSI, 1995; NIOSH, 1998). Some of these non-pulsed sounds can be transient signals of short duration but without the essential properties of pulses (*e.g.*, rapid rise time). Examples of non-pulsed sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems (such as those used by the U.S. Navy). The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

Impact hammers operate by repeatedly dropping a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is 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 weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound 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). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards, 2002; Carlson *et al.*, 2005). Down-hole drilling uses a drill bit that drills through the sediment and a pulse mechanism that functions at the bottom of the hole, using a pulsing bit to break up the harder materials or rock to allow removal of the fragments and insertion of the pile. The head extends so that the drilling takes place below the pile. Drilling is considered a continuous noise source, and has similar SPLs as vibratory driving.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals, and exposure to sound can have deleterious effects. To appropriately assess these potential effects, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.*, (2007) recommended that marine mammals be divided into functional hearing groups based on measured or estimated hearing ranges on the basis of available behavioral data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. The lower and/or upper frequencies for some of these functional hearing groups have been modified by NMFS from those designated by Southall *et al.*, (2007) as new information has become available. The functional groups and the associated frequencies are indicated below (note that these frequency ranges do not necessarily correspond to the range of best hearing, which varies by species):

- Low frequency cetaceans (13 species of mysticetes): Functional hearing is estimated to occur between approximately 7 Hz and 25 kHz (up to 30 kHz in some species), with best hearing estimated to be from 100 Hz to 8 kHz (Watkins, 1986; Ketten, 1998; Houser *et al.*, 2001; Au *et al.*, 2006; Lucifredi and Stein, 2007; Ketten *et al.*, 2007; Parks *et al.*, 2007a; Ketten and Mountain, 2009; Tubelli *et al.*, 2012);
- Mid-frequency cetaceans (32 species of dolphins, six species of larger toothed whales, and 19 species of beaked and bottlenose whales): Functional hearing is estimated to occur between approximately 150 Hz and 160 kHz with best hearing from 10 to less than 100 kHz (Johnson, 1967; White, 1977; Richardson *et al.*, 1995; Szymanski *et al.*, 1999; Kastelein *et al.*, 2003; Finneran *et al.*, 2005a, 2009; Nachtigall *et al.*, 2005, 2008; Yuen *et al.*, 2005; Popov *et al.*, 2007; Au and Hastings, 2008; Houser *et al.*, 2008; Pacini *et al.*, 2010, 2011; Schlundt *et al.*, 2011);
- High frequency cetaceans (eight species of true porpoises, six species of river dolphins, and members of the genera *Kogia* and *Cephalorhynchus*; now considered to include two members of the genus *Lagenorhynchus* on the basis of recent echolocation data and genetic data [May-Collado and Agnarsson, 2006; Kyhn *et al.* 2009, 2010; Tougaard *et al.* 2010]): Functional hearing is estimated to occur between approximately 200 Hz and 180 kHz (Popov and Supin, 1990a,b; Kastelein *et al.*, 2002; Popov *et al.*, 2005);
- Phocid pinnipeds in Water: Functional hearing is estimated to occur between approximately 75 Hz and 100 kHz with best hearing between 1–50 kHz (Møhl, 1968; Terhune and Ronald, 1971, 1972; Richardson *et al.*, 1995; Kastak and Schusterman, 1999; Reichmuth, 2008; Kastelein *et al.*, 2009); and
- Otariid pinnipeds in Water: Functional hearing is estimated to occur between approximately 100 Hz and 48 kHz, with best hearing between 2–48 kHz (Schusterman *et al.*, 1972; Moore and Schusterman, 1987; Babushina *et al.*, 1991; Richardson *et al.*, 1995; Kastak and Schusterman, 1998; Kastelein *et al.*, 2005a; Mulsow and Reichmuth, 2007; Mulsow *et al.*, 2011a, b).

The pinniped functional hearing group was modified from Southall *et al.* (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al.*, 2006; Kastelein *et al.*, 2009; Reichmuth *et al.*, 2013).

As mentioned previously in this document, six marine mammal species (four cetaceans and two pinnipeds) may occur in the project area. Of these four cetaceans, one is classified as a low-frequency cetacean (*i.e.*, humpback whale), one is classified as a mid-frequency cetacean (*i.e.*, killer whale), and two are classified as a high-frequency cetaceans (*i.e.*, harbor porpoise and Dall's porpoise) (Southall *et al.*, 2007). Additionally, harbor seals are classified as members of the phocid pinnipeds in water functional hearing group while Steller sea lions are grouped under the Otariid pinnipeds in water functional hearing group. A species' functional hearing group is a consideration when we analyze the effects of exposure to sound on marine mammals. Marine mammal hearing groups were also used in the establishment of marine mammal auditory weighting functions in the new acoustic guidance.

Acoustic Impacts

Please refer to the information given previously (*Description of Sound Sources*) regarding sound, characteristics of sound types, and metrics used in this document. Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic sources 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; Gordon *et al.*, 2004; Nowacek *et al.*, 2007; Southall *et al.*, 2007; Gotz *et al.*, 2009). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. In this section, we first describe specific manifestations of acoustic effects before providing discussion specific to the City's construction activities in the next section.

Permanent Threshold Shift—Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Kastak *et al.*, 1999; Schlundt *et al.*, 2000; Finneran *et al.*, 2002, 2005b). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al.*, 2007). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter, 1985).

When PTS occurs, there is physical damage to the sound receptors in the ear (*i.e.*, tissue damage), whereas TTS represents primarily tissue fatigue and is reversible (Southall *et al.*, 2007). In addition, other investigators have suggested that TTS is within the normal bounds of physiological variability and tolerance and does not represent physical injury (*e.g.*, Ward, 1997). Therefore, NMFS does not consider TTS to constitute auditory injury.

Relationships between TTS and PTS thresholds have not been studied in marine mammals—PTS data exists only for a single harbor seal (Kastak *et al.*, 2008)—but are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several decibels above (a 40-dB threshold shift approximates PTS onset; *e.g.*, Kryter *et al.*, 1966; Miller, 1974) that inducing mild TTS (a 6-dB threshold shift approximates TTS onset; *e.g.*, Southall *et al.* 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse sounds (such as impact pile driving pulses as received close to the source) are at least six dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level thresholds are 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall *et al.*, 2007).

Temporary threshold shift—TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter, 1985). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals, and none of the data published at the time of this writing concern TTS elicited by exposure to multiple pulses of sound.

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. 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 serious. For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin [*Tursiops trancatus*], beluga whale [*Delphinapterus leucas*], harbor porpoise, and Yangtze finless porpoise [*Neophocoena asiaeorientalis*]) and three species of pinnipeds (northern elephant seal [*Mirounga angustirostris*], harbor seal, and California sea lion [*Zalophus californianus*]) exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (*e.g.*, Finneran *et al.*, 2002; Nachtigall *et al.*, 2004; Kastak *et al.*, 2005; Lucke *et al.*, 2009; Popov *et al.*, 2011). In general, harbor seals (Kastak *et al.*, 2005; Kastelein *et al.*, 2012a) and harbor porpoises (Lucke *et al.*, 2009; Kastelein *et al.*, 2012b) have a lower TTS onset than other measured pinniped or cetacean species. Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. There are no data available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al.* (2007) and Finneran and Jenkins (2012).

Behavioral effects—Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*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 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.*, 2003; Southall *et al.*, 2007; 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). Please see Appendices B–C of Southall *et al.* (2007) for a review 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.*, 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. 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, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. As noted, behavioral state may affect the type of response. For example, animals that are resting 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; NRC, 2003; Wartzok *et al.*, 2003). Controlled experiments with captive marine mammals have showed 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 (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; see also Richardson *et al.*, 1995; 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. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, 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 to breathing, interference with or alteration of vocalization, avoidance, and flight.

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,b). 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 to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and 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 and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Variations in respiration naturally vary with different behaviors and alterations to 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 in 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, 2005b, 2006; Gailey *et al.*, 2007).

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 for any of these modes and may result from a need to compete with an increase in 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; Foote *et al.*, 2004), while right whales 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.*, 2007b). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al.*, 1994).

Avoidance is the displacement of an individual from an area or migration path as a result of 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). For example, grey whales are known to change direction—deflecting from customary migratory paths—in order to avoid noise from seismic surveys (Malme *et al.*, 1984). 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 abundance or distribution patterns of the affected species in the affected region if habituation to the presence of 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 to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (*e.g.*, directed movement, rate of travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus 1996). 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 (Evans and England 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 impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (*i.e.*, when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been demonstrated for marine mammals, but studies involving fish 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 reduction of fitness (*e.g.*, decline in body condition) and subsequent reduction 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 five-day period did not cause any sleep deprivation or stress effects.

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 are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.*, 2007). Consequently, a behavioral response lasting less than one 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 behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

Stress responses—An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.*, Seyle 1950; Moberg 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response 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 the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.*, Moberg 1987; Blecha 2000). Increases in the circulation of glucocorticoids are also equated 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 glycogen stores that 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 energetic reserves sufficient 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). Stress responses due 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. 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 it is possible that some of these would be classified as ''distress.'' In addition, any animal experiencing TTS would likely also experience stress responses (NRC 2003).

Auditory masking—Sound can disrupt behavior through masking, or interfering 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). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.*, snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.*, shipping, sonar, seismic exploration) in origin. 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.

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is man-made, it may be considered harassment when disrupting or altering 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.

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 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.*, 2007b; Di Iorio and Clark, 2009; 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 (Houser and Moore, 2014). 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. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.*, Branstetter *et al.*, 2013).

Masking affects both senders and receivers of acoustic signals and can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand, 2009). All anthropogenic sound sources, but especially chronic and lower-frequency signals (*e.g.*, from vessel traffic), contribute to elevated ambient sound levels, thus intensifying masking.

Non-auditory physiological effects—Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al.*, 2006; Southall *et al.*, 2007). Studies examining such effects are limited. In general, little is known about the potential for pile driving to cause auditory impairment or other physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would presumably be limited to short distances from the sound source, where SLs are much higher, and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al.*, 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of pile driving, including some odontocetes and some pinnipeds, are especially unlikely to incur auditory impairment or non-auditory physical effects.

Strandings—When a live or dead marine mammal swims or floats onto shore and is incapable of returning to sea, the event is termed a ''stranding'' (16 U.S.C. 1421h(3)). Marine mammals are known to strand for a variety of reasons, such as infectious agents, biotoxicosis, starvation, fishery interaction, ship strike, unusual oceanographic or weather events, sound exposure, or combinations of these stressors sustained concurrently or in series (*e.g.*, Geraci *et al.*, 1999). However, the cause or causes of most strandings are unknown (*e.g.*, Best 1982). Combinations of dissimilar stressors may combine to kill an animal or dramatically reduce its fitness, even though one exposure without the other would not be expected to produce the same outcome (*e.g.*, Sih *et al.*, 2004). For further description of stranding events see, *e.g.*, Southall *et al.*, 2006; Jepson *et al.*, 2013; Wright *et al.*, 2013. Strandings are not expected from the City's activities since construction activities are not associated with any of the reasons for strandings stated above, with the exception of sound exposure. However, the SLs from the construction activities are not at levels that cause injury or mortality, and therefore are not expected to cause strandings. If a stranded animal is observed, the City shall follow NMFS protocol described in the *Proposed Reporting Measures* section.

Underwater Acoustic Effects From the City's Activities

Potential Effects of Pile Driving Sound—The effects of sounds from pile driving might include one or more of the following: Temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, and masking (Richardson *et al.*, 1995; Gordon *et al.*, 2003; Nowacek *et al.*, 2007; Southall *et al.*, 2007). The effects of pile driving on marine mammals are dependent on several factors, including the type and depth of the animal; the pile size and type, and the intensity and duration of the pile driving sound; the substrate; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the frequency, received level, and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. In addition, substrates that are soft (*e.g.*, sand) would absorb or attenuate the sound more readily than hard substrates (*e.g.*, rock) which may reflect the acoustic wave. Soft porous substrates would also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

Hearing Impairment and Other Physical Effects—Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shifts. PTS constitutes injury, but TTS does not (Southall *et al.*, 2007). Based on the best scientific information available, the SPLs for the City's construction activities may exceed the thresholds that could cause TTS or the onset of PTS based on NMFS' new acoustic guidance (NMFS 2016a, 81 FR 51694; August 4, 2016).

Non-auditory Physiological Effects—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). The City's activities do not involve the use of devices such as explosives or mid-frequency active sonar that are associated with these types of effects, nor do they have SLs that may cause these extreme behavioral reactions, and are therefore, considered unlikely.

Disturbance Reactions—Responses to continuous sound, such as vibratory pile installation, have not been documented as well as responses to pulsed sounds. With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short term changes in an animal's typical behavior and/or avoidance of the affected area. These behavioral changes may include (Richardson *et al.*, 1995): Changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or flight responses (*e.g.*, pinnipeds flushing into water from haul-outs or rookeries). Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). If a marine mammal responds to a stimulus by changing its behavior (*e.g.*, through relatively minor changes in locomotion direction/speed or vocalization behavior), the response may or may not constitute taking at the individual level, and is unlikely to affect the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on animals, and if so potentially on the stock or species, could potentially be significant (*e.g.*, Lusseau and Bejder 2007; Weilgart 2007).

The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could be expected to be biologically significant if the change affects growth, survival, or reproduction. Significant behavioral modifications that could potentially lead to effects on growth, survival, or reproduction include:

- Drastic changes in diving/surfacing patterns (such as those thought to cause beaked whale stranding due to exposure to military mid-frequency tactical sonar);
- Longer-term habitat abandonment due to loss of desirable acoustic environment; and
- Longer-term cessation of feeding or social interaction.

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography) and is difficult to predict (Southall *et al.*, 2007).

Auditory Masking—Natural and artificial sounds can disrupt behavior by masking. The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. The most intense underwater sounds in the proposed action are those produced by impact pile driving. Given that the energy distribution of pile driving covers a broad frequency spectrum, sound from these sources would likely be within the audible range of marine mammals present in the project area. Impact pile driving activity is relatively short-term, and only used for proofing, with rapid pulses occurring for only a few minutes per pile. The probability for impact pile driving resulting from this proposed action masking acoustic signals important to the behavior and survival of marine mammal species is low. Vibratory pile driving is also relatively short-term. It is possible that vibratory pile driving resulting from this proposed action may mask acoustic signals important to the behavior and survival of marine mammal species, but the short-term duration and limited affected area would result in insignificant impacts from masking. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory and impact pile driving, and which have already been taken into account in the exposure analysis.

Airborne Acoustic Effects from the City's Activities—Pinnipeds that occur near the project site could be exposed to airborne sounds associated with pile driving that have the potential to cause behavioral harassment, depending on their distance from pile driving activities. Cetaceans are not expected to be exposed to airborne sounds that would result in harassment as defined under the MMPA.

Airborne noise will primarily be an issue for pinnipeds that are swimming or hauled out near the project site within the range of noise levels elevated above the acoustic criteria. We recognize that pinnipeds in the water could be exposed to airborne sound that may result in behavioral harassment when looking with heads above water. 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 reduction in vocalizations, or cause them to temporarily abandon the area and move further from the source. However, these animals would previously have been 'taken' as a result 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. Multiple instances of exposure to sound above NMFS' thresholds for behavioral harassment are not believed to result in increased behavioral disturbance, in either nature or intensity of disturbance reaction. Therefore, we do not believe that authorization of incidental take resulting from airborne sound for pinnipeds is warranted, and airborne sound is not discussed further here.

Ambient noise—The transient float project area is frequented by fishing vessels and tenders; ferries, barges, tugboats; and other commercial and recreational vessels that use the channel to access harbors and city docks, fuel docks, processing plants where fish catches are offloaded, and other commercial facilities. At the seafood processing plant, to the southwest of the transient float, fish are offloaded by vacuum hose straight into the processing plant from the vessels' holds, and vessels raft up three and four deep to the dock during peak fishing seasons. Northeast of the processing plant is the Pier 1 Kodiak Ferry Terminal, which is an active ferry terminal and multi-use dock in Near Island Channel. Between the ferry terminal and the transient float is the Petro Marine fuel dock, which services a range of vessel sizes, including larger vessels that can be accommodated by docking at the transient float. Two boat harbors exist in Near Island Channel, which house a number of commercial and recreational marine vessels. The channel is also a primary route for local vessel traffic to access waters outside the Gulf of Alaska.

High levels of vessel traffic are known to elevate background levels of noise in the marine environment. For example, continuous sounds for tugs pulling barges have been reported to range from 145 to 166 dB re 1 μPa rms at 1 meter from the source (Miles *et al.*, 1987; Richardson *et al.*, 1995; Simmonds *et al.*, 2004). Ambient underwater sound was measured in Near Island Channel, approximately 100 m southwest and 900 m northeast of the Transient Float, in March 2016 during construction of the Pier 1 Kodiak Ferry Terminal and Dock Improvements Project. Measurements recorded highly variable sound pressure levels (SPLs), ranging from approximately 80 to 140 decibels referenced to one microPascal (dB re 1 μPa). Peaks ranging from approximately 130 to 140 dB re 1 μPa were produced by vessels passing near acoustic recorders (Warner and Austin 2016). Ambient underwater noise levels in the transient float project area are both variable and relatively high, and are expected to mask some sounds of drilling, pile installation, and pile extraction.

Potential Effects on Marine Mammal Habitat

The primary potential impacts to marine mammal habitat are associated with elevated sound levels produced by vibratory and impact pile driving and removal in the area, and down-hole drilling. However, other potential impacts to the surrounding habitat from physical disturbance are also possible.

Potential Pile Driving Effects on Prey—Construction activities would produce continuous (*i.e.,* vibratory pile driving, down-hole drilling) sounds and pulsed (*i.e.* impact driving) sounds. Essential Fish Habitat (EFH) has been designated within the project area for the Alaska stocks of Pacific salmon, walleye pollock, Pacific cod, yellowfin sole (*Limanda aspera*), arrowtooth flounder (*Atheresthes stomias*), rock sole (*Lepidopsetta spp.*), flathead sole (*Hippoglossoides elassodon*), sculpin (Cottidae), skate (Rajidae), and squid (Teuthoidea). In accordance with the EFH requirements of the Magnuson-Stevens Fishery Conservation and Management Act, NMFS notified the Alaska regional office about this activity, and EFH consultation was not considered necessary for issuance of this IHA.

Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. 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 fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.,* Scholik and Yan 2001, 2002; Popper and Hastings 2009). Sound pulses at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Pearson *et al.,* 1992; Skalski *et al.,* 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality.

The most likely impact to fish from pile driving activities at the project area would be temporary behavioral avoidance of the area since the majority of the construction activities will be at SLs lower than 160 dB. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. In general, because the majority of SLs will be 160 dB or lower, and the duration of the project is short (*e.g.,* 12 days), impacts to marine mammal prey species are expected to be minor and temporary.

Effects to Foraging Habitat—Pile installation may temporarily increase turbidity resulting from suspended sediments. Any increases would be temporary, localized, and minimal. The City must comply with state water quality standards during these operations by limiting the extent of turbidity to the immediate project area. In general, turbidity associated with pile installation is localized to about a 25-foot radius around the pile (Everitt *et al.,* 1980). Cetaceans are not expected to be close enough to the project pile driving areas to experience effects of turbidity, and any pinnipeds will be transiting the area and could avoid localized areas of turbidity. Therefore, the impact from increased turbidity levels is expected to be discountable to marine mammals. Furthermore, pile driving and removal at the project site will not obstruct movements or migration of marine mammals.

Proposed Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, ''and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking'' for certain subsistence uses.

For the proposed project, the City worked with NMFS and proposed the following mitigation measures to minimize the potential impacts to marine mammals in the project vicinity. The primary purposes of these mitigation measures are to minimize sound levels from the activities, and to monitor marine mammals within designated zones of influence corresponding to NMFS' current Level A and B harassment thresholds. The Level B zones are depicted in Table 5 found later in the *Estimated Take by Incidental Harassment* section.

Observer Qualifications—Monitoring would be conducted before, during, and after pile driving and removal activities. Monitoring will be conducted by a minimum of two qualified marine mammal observers (MMOs), who will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator. NMFS has minimum requirements for MMOs at the construction site, as well as specific qualifications (*e.g.,* experience) needed of each MMO. MMO requirements for construction actions are as follows:

1. Independent observers (*i.e.,* not construction personnel) are required.
2. At least one observer must have prior experience working as an observer.
3. Other observers (that do not have prior experience) may substitute education (undergraduate degree in biological science or related field) or training for experience.
4. Where a team of three or more observers are required, one observer should be designated as lead observer or monitoring coordinator. The lead observer must have prior experience working as an observer.
5. NMFS will require submission and approval of observer CVs.

Qualified MMOs are trained biologists, and need the following additional minimum qualifications:

(a) Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target;

(b) Ability to conduct field observations and collect data according to assigned protocols

(c) Experience or training in the field identification of marine mammals, including the identification of behaviors

(d) Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations

(e) Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined shutdown zone; and marine mammal behavior

(f) Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary

Monitoring Protocols—The City will conduct briefings between construction supervisors and crews, marine mammal monitoring team, and City staff prior to the start of all pile driving activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

Prior to the start of pile driving activity, the shutdown zone will be monitored for 30 minutes to ensure that it is clear of marine mammals. Pile driving will only commence once observers have declared the shutdown zone clear of marine mammals; animals will be allowed to remain in the shutdown zone (*i.e.,* must leave of their own volition) and their behavior will be monitored and documented. The shutdown zone may only be declared clear, and pile driving started, when the entire shutdown zone is visible (*i.e.,* when not obscured by dark, rain, fog, etc.).

If a marine mammal approaches or enters the shutdown zone during the course of pile driving operations, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 30 minutes have passed without re-detection of the animal. Monitoring will be conducted throughout the time required to drive a pile, through 30 minutes post-completion of pile driving activities. Pile driving activities include the time to remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes.

Observers shall record all incidents of marine mammal occurrence, regardless of distance from activity, and shall document any behavioral reactions in concert with distance from piles being driven. Observations made outside the shutdown zone will not result in shutdown; that pile segment would be completed without cessation, unless the animal approaches or enters the shutdown zone, at which point all pile driving activities would be halted, as described below. Please see Appendix B of the City's application for details on the marine mammal monitoring plan developed by the City with NMFS' cooperation.

Ramp Up or Soft Start—The use of a soft start procedure is believed to provide additional protection to marine mammals by warning or providing a chance to leave the area prior to the impact hammer operating at full capacity, and typically involves a requirement to initiate sound from the hammer at reduced energy followed by a waiting period. This procedure is repeated two additional times. It is difficult to specify the reduction in energy for any given hammer because of variation across drivers. The project will utilize soft start techniques for all impact pile driving. NMFS will require the City to initiate sound from impact driving with an initial set of three strikes from the impact hammer at reduced energy, followed by a 1-minute waiting period, then two subsequent three strike sets. Soft start will be required at the beginning of each day's impact pile driving work and at any time following a cessation of pile driving of 30 minutes or longer.

If a marine mammal is present within the Level A harassment zone, ramping up will be delayed until the animal(s) leaves the Level A harassment zone. Activity will begin only after the MMO has determined, through sighting, that the animal(s) has moved outside the Level A harassment zone.

If a Steller sea lion, harbor seal, harbor porpoise, Dall's porpoise, humpback whale, or killer whale is present in the Level B harassment zone, ramping up will begin and a Level B take will be documented. Ramping up will occur when these species are in the Level B harassment zone whether they entered the Level B zone from the Level A zone, or from outside the project area.

If any marine mammal other than Steller sea lions, harbor seals, harbor porpoises, Dall's porpoise, humpback whale, or killer whales is present in the Level B harassment zone, ramping up will be delayed until the animal(s) leaves the zone. Ramping up will begin only after the MMO has determined, through sighting, that the animal(s) has moved outside the harassment zone.

Pile Caps—Pile caps or cushions will be used during all impact pile-driving activities.

Shutdown Zone—For all pile driving activities, the City will establish a shutdown zone. Shutdown zones are intended to contain the area in which SPLs equal or exceed acoustic injury criteria, with the purpose being to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area), thus preventing injury of marine mammals. Using the user spreadsheet for the new acoustic guidance, injury zones were determined for each of the hearing groups. These zones would be rounded to the nearest 10 or 100 m to be more conservative (Table 3). As a precautionary measure, intended to reduce the unlikely possibility of injury from direct physical interaction with construction operations, the City would implement a minimum shutdown zone of 10 m radius around each pile for all construction methods for all marine mammals. Additionally, to avoid acoustic injury, the following shutdown zones will be in place for all construction methods (vibratory extraction and installation, down-hole drilling, and impact driving): 100 m for humpback whales, harbor porpoise, and Dall's porpoise, 50 m for harbor seals, and 10 m for killer whales and Steller sea lions (Table 3).

TABLE 3—INJURY ZONES AND SHUTDOWN ZONES FOR HEARING GROUPS FOR EACH CONSTRUCTION METHOD

Hearing group	Low-frequency cetaceans	Mid-frequency cetaceans	High-frequency cetaceans	Phocid pinnipeds	Otariid pinnipeds
Vibratory installation/extraction [1]					
PTS Isopleth to threshold (m)	7.1 (8)	1.4 (2)	9.3 (10)	5.1 (6)	0.8 (1)
Down-hole drilling [2]					
PTS Isopleth to threshold (m)	71.7 (100)	7.3 (8)	64.6 (100)	43.7 (100)	5.5 (6)
Impact driving [3]					
PTS Isopleth to threshold (m)	3.7 (4)	0.3 (1)	4.3 (5)	2.4 (3)	0.3 (1)
Shutdown zone (m)	100	* 10	100	50	* 10

Note: Numbers in parentheses are the rounded zones (to the nearest 1 if under 10 m, and 10 or 100 m)
* The minimum 10 m shutdown in place for all construction projects would cover the injury zones for these hearing groups.
[1] For vibratory driving, SL is 183.8, TL is 21.9logR, weighting function is 2.5, duration is 0.69 hours, and distance from the source is one m.
[2] For down-hole drilling, SL is 192.5, TL is 18.9logR, weighting function is two, duration is four hours, and distance from the source is 1 m.
[3] For impact driving, SL is 205.9, weighting function is two, duration is 0.3, pulse duration is 0.05, TL is 20.3log R, strikes per pile is five, and distance from the source is 1 m.

For in-water heavy machinery work other than pile driving (using, *e.g.,* standard barges, tug boats, barge-mounted excavators, or clamshell equipment used to place or remove material), if a marine mammal comes within 10 m, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.

Disturbance Zone—Disturbance zones are the areas in which sound pressure levels (SPLs) equal or exceed 120 dB rms (for continuous sound) and 160 dB rms (for impulsive sound) for pile driving installation and removal. Disturbance zones provide utility for monitoring conducted for mitigation purposes (*i.e.,* shutdown zone monitoring) by establishing monitoring protocols for areas adjacent to the shutdown zones. The disturbance zone will be monitored by appropriately stationed MMOs. Monitoring of disturbance zones enables observers to be aware of and communicate the presence of marine mammals in the project area but outside the shutdown zone and thus prepare for potential shutdowns of activity. However, the primary purpose of disturbance zone monitoring is for documenting incidents of Level B harassment.

Any marine mammal documented within the Level B harassment zone would constitute a Level B take (harassment), and will be recorded and reported as such. Nominal radial distances for disturbance zones are shown in Table 4. Given the size of the disturbance zone for vibratory pile driving, it is impossible to guarantee that all animals would be observed or to make comprehensive observations of fine-scale behavioral reactions to sound, and only a portion of the zone (*e.g.,* what may be reasonably observed by visual observers) would be observed.

In order to document observed incidents of harassment, monitors record all marine mammal observations, regardless of location. The observer's location, as well as the location of the pile being driven or removed, is known from a GPS. The location of the animal is estimated as a distance from the observer, which is then compared to the location from the pile. It may then be estimated whether the animal was exposed to sound levels constituting incidental harassment on the basis of predicted distances to relevant thresholds in post-processing of observational and acoustic data, and a precise accounting of observed incidences of harassment created. This information may then be used to extrapolate observed takes to reach an approximate understanding of actual total takes.

Level B take of grey whales and fin whales is not requested and will be avoided by shutting down before individuals of these species enter the Level B zones.

TABLE 4—CALCULATED THRESHOLD DISTANCES (m) FROM AN ACOUSTIC MONITORING STUDY CONDUCTED AT THE PIER 1 IN MARCH 2016

Source	Threshold distances (m)	
	160 dB	120 dB
Vibratory pile driving/extraction	n/a	821 (900)
Down-hole drilling	n/a	6846 (7,000)
Impact pile driving	183 (200)	n/a

Note: Numbers in parentheses are the rounded zones (to the nearest 100 or 1,000 m).

In order to document observed incidents of harassment, MMOs record all marine mammal observations, regardless of location. The observer's location, as well as the location of the pile being driven, is known from a GPS. The location of the animal is estimated as a distance from the observer, which is then compared to the location from the pile and the estimated zone of influence (ZOI) for relevant activities (*i.e.,* pile installation and removal). This information may then be used to extrapolate observed takes to reach an approximate understanding of actual total takes.

Time Restrictions—Work would occur only during daylight hours, when visual monitoring of marine mammals can be conducted. To minimize impacts to pink salmon (*Oncorhynchus gorbuscha*) fry and coho salmon (*O. kisutch*) smolt, the City will refrain from impact pile driving from May 1, 2017 through June 30, 2017. If impact pile-driving occurs from May 1 through June 30, it will occur in the evenings during daylight hours, after the 12-hour period that begins at civil dawn.

Proposed measures to ensure availability of such species or stock for taking for certain subsistence uses are discussed later in this document (see *Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses* section).

Mitigation Conclusions

NMFS has carefully evaluated the applicant's proposed mitigation measures and considered a range of other measures in the context of ensuring that NMFS prescribes the means of affecting the least practicable impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another:

- The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammal species or stocks;
- The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and
- The practicability of the measure for applicant implementation.

Any mitigation measure(s) prescribed by NMFS should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed below:

1. Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).
2. A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to received levels of pile driving and down-hole drilling, or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).
3. A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to received levels of pile driving and down-hole drilling, or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).
4. A reduction in the intensity of exposures (either total number or number at biologically important time or location) to received levels of pile driving and down-hole drilling, or other activities expected to result in the take of marine mammals (this goal may contribute to a, above, or to reducing the severity of harassment takes only).
5. Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time.
6. For monitoring directly related to mitigation—an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on our evaluation of the applicant's proposed measures, as well as other measures considered by NMFS, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammals species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Proposed Monitoring and Reporting

In order to issue an ITA 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 ITAs 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 in the proposed action area. The City submitted a marine mammal monitoring plan as part of the IHA application. It can be found in Appendix B of their application. The plan may be modified or supplemented based on comments or new information received from the public during the public comment period.

Monitoring measures prescribed by NMFS should accomplish one or more of the following general goals:

1. An increase in the probability of detecting marine mammals, both within the mitigation zone (thus allowing for more effective implementation of the mitigation) and in general to generate more data to contribute to the analyses mentioned below;
2. An increase in our understanding of how many marine mammals are likely to be exposed to levels of pile driving and down-hole drilling that we associate with specific adverse effects, such as behavioral harassment, TTS, or PTS;

3. An increase in our understanding of how marine mammals respond to stimuli expected to result in take and how anticipated adverse effects on individuals (in different ways and to varying degrees) may impact the population, species, or stock (specifically through effects on annual rates of recruitment or survival) through any of the following methods:

▪ Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict received level, distance from source, and other pertinent information);

▪ Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict received level, distance from source, and other pertinent information);

▪ Distribution and/or abundance comparisons in times or areas with concentrated stimuli versus times or areas without stimuli;

4. An increased knowledge of the affected species; and

5. An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

Visual Marine Mammal Observation

The City will collect sighting data and behavioral responses to construction for marine mammal species observed in the region of activity during the period of activity. All observers will be trained in marine mammal identification and behaviors and are required to have no other construction-related tasks while conducting monitoring. As discussed previously, the City will monitor the shutdown zone and disturbance zone before, during, and after pile driving. The MMOs and the City authorities will meet to determine the most appropriate observation platform(s) for monitoring during pile installation and extraction.

Based on our MMO requirements, the Marine Mammal Monitoring Plan would implement similar procedures as those described in the *Proposed Mitigation section.*

Data Collection

We require that observers use approved data forms. Among other pieces of information, the City will record detailed information about any implementation of shutdowns, including the distance of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any. In addition, the City will attempt to distinguish between the number of individual animals taken and the number of incidents of take. We require that, at a minimum, the following information be collected on the sighting forms:

- Date and time that monitored activity begins or ends;
- Construction activities occurring during each observation period;
- Weather parameters (*e.g.,* percent cover, visibility);
- Water conditions (*e.g.,* sea state, tide state);
- Species, numbers, and, if possible, sex and age class of marine mammals;
- Description of any observable marine mammal behavior patterns, including bearing and direction of travel and distance from pile driving activity;
- Distance from pile driving activities to marine mammals and distance from the marine mammals to the observation point;
- Locations of all marine mammal observations; and
- Other human activity in the area.

Proposed Reporting Measures

The City would provide NMFS with a draft monitoring report within 90 days of the conclusion of the proposed construction work. The report will include marine mammal observations pre-activity, during-activity, and post-activity during pile driving days, and will also provide descriptions of any behavioral responses to construction activities by marine mammals and a complete description of all mitigation shutdowns and the results of those actions and an extrapolated total take estimate based on the number of marine mammals observed during the course of construction. A final report must be submitted within thirty days following resolution of comments on the draft report. If no comments are received from NMFS within 30 days, the draft final report will constitute the final report. If comments are received, a final report must be submitted within 30 days after receipt of comments.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA (if issued), such as serious injury or mortality (*e.g.,* ship-strike, gear interaction, and/or entanglement), the City would immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Alaska Stranding Coordinator. The report would include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (*e.g.,* wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities would not resume until NMFS is able to review the circumstances of the prohibited take. NMFS would work with the City to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. The City would not be able to resume their activities until notified by NMFS via letter, email, or telephone.

In the event that the City discovers an injured or dead marine mammal, and the lead MMO determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.,* in less than a moderate state of decomposition as described in the next paragraph), the City would immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Alaska Stranding Coordinator.

The report would include the same information identified in the paragraph above. Activities would be able to continue while NMFS reviews the circumstances of the incident. NMFS would work with the City to determine whether modifications in the activities are appropriate.

In the event that the City discovers an injured or dead marine mammal, and the lead MMO determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.,* previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), the City would report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the NMFS West Coast Stranding Hotline and/or by email to the Alaska Stranding Coordinator, within 24 hours of the discovery. The City would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network.

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, 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 causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

All anticipated takes would be by Level B harassment resulting from vibratory pile driving and removal, impact pile driving, or down-hole drilling. Level B harassment may result in temporary changes in behavior. Note that injury, serious injury, and lethal takes are not expected, and are not authorized, for these activities due to the proposed mitigation and monitoring measures that are expected to minimize the possibility of such take.

If a marine mammal responds to a stimulus by changing its behavior (*e.g.,* through relatively minor changes in locomotion direction/speed or vocalization behavior), the response may or may not constitute taking at the individual level, and is unlikely to affect the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on animals or on the stock or species could potentially be significant (*e.g.,* Lusseau and Bejder, 2007; Weilgart, 2007). Given the many uncertainties in predicting the quantity and types of impacts of sound on marine mammals, it is common practice to estimate how many animals are likely to be present within a particular distance of a given activity, or exposed to a particular level of sound, in order to estimate take.

Upland work can generate airborne sound and create visual disturbance that could potentially result in disturbance to marine mammals (specifically, pinnipeds) that are hauled out or at the water's surface with heads above the water. However, because there are no regular haul-outs in close proximity to the Kodiak transient float, NMFS believes that incidents of incidental take resulting from airborne sound or visual disturbance are unlikely.

The City has requested authorization for the incidental taking of small numbers, by Level B harassment, of harbor porpoise, Dall's porpoise, killer whale, humpback whale, Steller sea lion, and harbor seal near the project area that may result from impact and vibratory pile driving, vibratory pile removal, and down-hole drilling construction activities associated with the transient float project.

The calculation for estimating marine mammal exposures to underwater noise is:

Exposure estimate = number of animals exposed/day * number of days of activity

In order to estimate the potential incidents of take that may occur incidental to the specified activity, we must first estimate the extent of the sound field that may be produced by the activity and then consider the sound field in combination with information about marine mammal density or abundance in the project area. We first provide information on applicable sound thresholds for determining effects to marine mammals before describing the information used in estimating the sound fields, the available marine mammal density or abundance information, and the method of estimating potential incidences of take.

Sound Thresholds

We use the following generic sound exposure thresholds (Table 5) to determine when an activity that produces sound might result in impacts to a marine mammal such that a take by behavioral harassment (Level B) might occur.

TABLE 5—UNDERWATER DISTURBANCE THRESHOLD DECIBEL LEVELS FOR MARINE MAMMALS

Criterion	Criterion definition	Threshold *
Level B harassment	Behavioral disruption for impulse noise (*e.g.,* impact pile driving)	160 dB RMS.
Level B harassment	Behavioral disruption for non-pulse noise (*e.g.,* vibratory pile driving, drilling)	120 dB RMS.

* All decibel levels referenced to 1 micropascal (re: 1 μPa). Note all thresholds are based off root mean square (RMS) levels.

We use NMFS' new acoustic criteria (NMFS 2016a, 81 FR 51694; August 4, 2016) to determine sound exposure thresholds to determine when an activity that produces sound might result in impacts to a marine mammal such that a take by injury, in the form of Permanent Threshold Shift (PTS), might occur.

Distance to Sound Thresholds

The sound field in the project area is the existing ambient noise plus additional construction noise from the proposed project. The primary components of the project expected to affect marine mammals is the sound generated by impact pile driving, vibratory pile driving, vibratory pile removal, and down-hole drilling.

After vibratory hammering has installed the pile through the overburden to the top of the bedrock layer, the vibratory hammer will be removed, and the down-hole drill will be inserted through the pile. The head extends below the pile and the drill rotates through soils and rock. The drilling/hammering takes place below the sediment layer and, as the drill advances, below the bedrock layer as well. Underwater noise levels are relatively low because the impact is taking place below the substrate rather than at the top of the piling, which limits transmission of noise through the water column. Additionally, there is a drive shoe welded on the bottom of the pile, and the upper portion of the bit rests on the shoe, which aids in advancement of the pile as drilling progresses. When the proper depth is achieved, the drill is retracted and the pile is left in place. Impact hammering typically generates the loudest noise associated with pile driving, but for the transient float project, use will be limited to a few blows per 24-inch steel pile.

Several factors are expected to minimize the potential impacts of pile-driving and drilling noise associated with the project:

• The soft sediment marine seafloor and shallow waters in the proposed project area;
• Land forms across the channel that will block the noise from spreading; and
• The relatively high background noise level in the project area.

Sound will dissipate relatively rapidly in the shallow waters over soft seafloors in the project area (NMFS 2013). St. Herman Harbor (Figure 2 in the application), where the Dog Bay float is located, is protected from the transient float construction noise by land projections and islands, which will block and redirect sound. Near Island and Kodiak Island, on either side of Near Island Channel, prevent the sound from travelling underwater to the north, south, and southeast, restricting the noise to most of the channel; however a narrow band of noise may extend to Woody Island, approximately 3.75 km to the East.

The project includes vibratory removal of 12-inch timber and steel piles; and vibratory installation and down-hole drilling of permanent 24-inch steel piles. Each 24-inch pile may also be subject to a few blows from an impact hammer for proofing. No data are available for vibratory removal of piles, so it will be conservatively assumed that vibratory removal of piles will produce the same source level as vibratory installation.

SPLs for this project were used from the nearby Pier 1 Kodiak ferry terminal measurements of 24-in steel piles from JASCO 2016 (Warner and Austin 2016). The ferry terminal is approximately 100 m from the transient float, and therefore has similar environmental conditions, and the project used the same installation methods and same size piles, making this a good proxy. Vibratory driving had a measured SL of 183.8 dB rms at 1 m. Down-hole drilling had a measured SL of 192.5 dB at 1 m. Impact pile driving had a measured SL of 205.9 at 1 m.

Underwater Sound Propagation Formula—Pile driving generates underwater noise that can potentially result in disturbance to marine mammals in the project area. 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, and 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

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

NMFS typically recommends a default practical spreading loss of 15 dB per tenfold increase in distance. However, for this analysis for the transient float project area, a TL of 21.9Log(R/10) (*i.e.,* 21.9-dB loss per tenfold increase in distance) was used for vibratory pile driving, 18.9Log(R/10) was used for down-hole drilling, and a 20.3Log TL(R/10) function was used for impact driving (Warner and Austin 2016). TL values were based on measured attenuation rates at the Pier 1, Kodiak Ferry Terminal, located approximately 100m away from the transient float project area.

Distances to the harassment isopleths vary by marine mammal type and pile extraction/driving tool. The isopleth for Level A harassment are summarized in Table 3, and the isopleths for Level B harassment are summarized in Table 4. The ZOIs will be rounded up to the nearest 10, 100, or 1,000 m for the transient float project.

Note that the actual area ensonified by pile driving activities is significantly constrained by local topography relative to the total threshold radius. The actual ensonified area was determined using a straight line-of-sight projection from the anticipated pile driving locations. Distances to the underwater sound isopleths for Level B and Level A are illustrated respectively in Figures 15–17 in the City's application.

The method used for calculating potential exposures to impact and vibratory pile driving noise for each threshold was estimated using local marine mammal data sets, monitoring reports from previous projects in the same vicinity, best professional judgment from state and federal agencies, and data from take estimates on similar projects with similar actions. All estimates are conservative and include the following assumptions:

- All pilings installed at each site would have an underwater noise disturbance equal to the piling that causes the greatest noise disturbance (*i.e.,* the piling farthest from shore) installed with the method that has the largest ZOI. The largest underwater disturbance ZOI would be produced by down-hole drilling. The ZOIs for each threshold are not spherical and are truncated by land masses on either side of the channel which would dissipate sound pressure waves;
- Exposures were based on estimated work hours. Numbers of days were based on an average production rate of eight hours of vibratory driving/extraction, 48 hours of down-hole drilling, and less than one hour of impact driving and. Note that impact driving is likely to occur only on days when vibratory driving occurs; and
- In absence of site specific underwater acoustic propagation modeling, the practical spreading loss model was used to determine the ZOI.

Steller Sea Lion

Steller sea lions are common in the project area and may be encountered daily. Pinniped population estimates are typically made when the animals are hauled out and available to be counted. There have been numerous counts of Steller sea lions in this area over the past few years. Aerial surveys from 2004 through 2006 indicated peak winter (October–April) counts at the Dog Bay float ranging from 27 to 33 animals (Wynne *et al.,* 2011). More than 100 Steller sea lions were counted on the Dog Bay float at times in spring 2015, although the mean number was much smaller (Wynne 2015b). Counts in February 2015 during a site visit by HDR biologists ranged from approximately 28 to 45 Steller sea lions.

According to ABR (2016), however, maximal weekly counts of sea lions at Dog Bay float were only loosely correlated with weekly average-hourly rates of sea lion observations within the construction area. Near Island Channel counts of Steller sea lions adjacent to Pier 1 have ranged from zero to approximately 25 sea lions at one time (FHWA and DOT&PF 2015). More recent counts completed between November 2015 and June 2016 by protected species observers (PSOs) working on the Kodiak Ferry Terminal and Dock Improvements Project (approximately 100 m from the transient float) ranged from approximately 6 to 114 Steller sea lions, with an average of 33 (ABR 2016). It has been estimated that about 40 unique individual sea lions likely pass by the project site each day (Speckman 2015, Ward 2015, Wynne 2015a). Incidental take was estimated for Steller sea lions by conservatively assuming that, within any given day, approximately 40 unique individual Steller sea lions may be present at some time during that day within the Level B harassment zones during active pile extraction or installation.

It is assumed that Steller sea lions may be present every day, and also that take will include multiple harassments of the same individual(s) both within and among days, which means that these estimates are likely an overestimate of the number of individuals.

An estimated total of 480 Steller sea lions (40 sea lions/day * 12 days of pile installation or extraction) could be exposed to noise at the Level B harassment level during vibratory and impact pile driving (Table 6).

The attraction of sea lions to the seafood processing plant increases the possibility of individual Steller sea lions occasionally entering the Level A harassment zone (the largest injury zone is 5.5 m during down-hole drilling); however a minimum 10 m shutdown would be in effect for all construction methods, thereby eliminating the potential for Level A harassment. No level A take is authorized for Steller sea lions.

Harbor Seal

Harbor seals are expected to be encountered in low numbers within the project area. However, based on the known range of the South Kodiak stock, 13 single sightings during 110 days of monitoring of the Kodiak Ferry Terminal and Dock Improvements Project, and occasional sightings during monitoring of projects at other locations on Kodiak Island, it is assumed that harbor seals could be present every day. This analysis conservatively assumes that harbor seals could be present on any one day during the 12 days of pile installation and removal. Using this number, it is estimated that 48 harbor seals could be exposed to noise at the level B harassment level during in-water construction activities (Table 6). We assumed three harbor seals (the maximum number of seals observed during the Kodiak Ferry Terminal and Dock Improvements Project over 110 days of monitoring) may be seen in Near Island Channel for 36 takes, and included an additional one seal per day that may be present in the larger 120 dB zone for an additional 12 seals.

The shutdown zone for harbor seals is 50 m for all construction methods. Because this shutdown zone covers the entire injury zone (10 m for impact and vibratory, and 50 m for down-hole drilling), Level A harassment can be avoided. No level A take is authorized for harbor seals.

Harbor Porpoise

Harbor porpoises are expected to be encountered in low numbers within the project area. Based on the known range of the Gulf of Alaska stock, six sightings of singles or pairs only during 110 days of monitoring of the Kodiak Ferry Terminal and Dock Improvements project, and occasional sightings during monitoring of projects at other locations on Kodiak Island, it is assumed that harbor porpoises could be present every day. Dahlheim (2009, 2015) states that the average group size of harbor porpoise is between one and two individuals. To be conservative, we assumed groups of two animals may be seen on any given day. NMFS proposes 24 Level B takes (two animals on 12 days) of harbor porpoises by exposure to underwater noise over the duration of construction activities (Table 6).

A shutdown zone of 100 m would be established for all construction methods for harbor porpoise. The largest injury zone is 64.6 m (rounded to 100 m) for this species; therefore, level A take can be avoided. No Level A take is authorized for harbor porpoise.

Dall's Porpoise

Dall's porpoises are expected to be encountered within the project area rarely. Although no sightings of Dall's porpoise occurred during 110 days monitoring of the Kodiak Ferry Terminal and Dock Improvements Project, the project area is within the known range of the Gulf of Alaska stock and they have been observed at other locations on Kodiak Island. This project also includes a narrow band that will be ensonified extending to Woody Island, where Dall's porpoise may be present. There is minimal information on group sizes of this species in the Kodiak area. Dahlheim (2009) noted mean group size of Dall's porpoise in Southeast Alaska between the Spring and Fall of 1991–2007 ranged from 2.51 to 5.46 animals, with average group sizes between 2.77 and 3.55. OBIS SEAMAP states that Dall's porpoise usually form small groups between two and 12 individuals, and had two observations of Dall's porpoise near Kodiak Island with group sizes of one and two individuals (Halpin 2009 at OBIS–SEAMAP 2016). We therefore, conservatively, assume that Dall's porpoises with an average group size of seven individuals could be present in the area every other day of in-water construction. NMFS proposes 42 Dall's porpoise level B takes (7 animal/day * 6 days of pile activity).

No Level A takes are requested for this species. No Level A take is expected since Dall's porpoise are uncommon in the area, preferring deeper waters, and there would be a 100 m shutdown for all construction methods for Dall's porpoise to further reduce the likelihood of injury.

Killer Whale

Killer whales are expected to be in the Kodiak harbor area sporadically from January through April and to enter the project area in low numbers. Four killer whale pods were observed during 110 days of monitoring for the Kodiak Ferry Terminal and Dock Improvements Project with the largest pod size of seven individuals. NMFS estimates that pod of seven individual whales may enter the project area twice during the 12 days of pile installation and removal. NMFS therefore proposes 14 Level B takes (7 killer whales/visit * 2 days) of killer whales by exposure to underwater noise over the duration of construction activities. No Level A take is requested under this authorization, since the injury zones are very small (10 m for all methods), and it is unlikely a killer whale would come that close to the piles. NMFS also expects that construction could be shut down before the whales enter the Level A harassment area.

Humpback Whale

Humpback whales are rare in the action area. One solitary animal was observed in March 2016 during 110 days monitoring of the Kodiak Ferry Terminal and Dock Improvements Project. Conservatively, it assumed that one individual could be present in the area on half of the days of in-water construction. NMFS therefore proposes six Level B takes (Table 6). Because humpback whales are rare in the area, and there would be a 100 m shutdown in place that covers the injury zones (10 m for impact and vibratory, and 100 m for down-hole drilling), no Level A takes are authorized for this species.

Based on Wade *et al.* (2016), the probability is that five of the humpback whales that would be taken through Level B acoustic harassment would be from the Hawaii DPS (not listed under ESA), one humpback whale would be from threatened Mexico DPS, and no humpback whales would be from the endangered Western North Pacific DPS.

TABLE 6—SUMMARY OF THE ESTIMATED NUMBERS OF MARINE MAMMALS POTENTIALLY EXPOSED TO LEVEL A AND LEVEL B HARASSMENT NOISE LEVELS

Species	Level A injury takes	Level B harassment takes	Total
Steller sea lion	0	480	480
Harbor seal	0	48	48
Harbor porpoise	0	24	24
Dall's porpoise	0	42	42
Killer whale	0	14	14

TABLE 6—SUMMARY OF THE ESTIMATED NUMBERS OF MARINE MAMMALS POTENTIALLY EXPOSED TO LEVEL A AND LEVEL B HARASSMENT NOISE LEVELS—Continued

Species	Level A injury takes	Level B harassment takes	Total
Humpback whale	0	6	6
Total	0	614	614

Analysis and Preliminary Determinations

Negligible Impact

Negligible impact is ''an impact resulting from the specified activity that cannot be reasonably 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 lack of likely adverse effects on annual rates of recruitment or survival (*i.e.,* population-level effects). An estimate of the number of takes, alone, is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be ''taken,'' NMFS must consider other factors, such as the likely nature of any responses (their intensity, duration, etc.), the context of any responses (critical reproductive time or location, migration, etc.), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, effects on habitat, and the status of the species.

To avoid repetition, the discussion of our analyses applies to all the species listed in Table 6, given that the anticipated effects of this pile driving project on marine mammals are expected to be relatively similar in nature. There is no information about the size, status, or structure of any species or stock that would lead to a different analysis for this activity, else species-specific factors would be identified and analyzed.

Pile extraction, pile driving, and down-hole drilling activities associated with the reconstruction of the transient float, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level B harassment (behavioral disturbance) from underwater sounds generated from pile driving and drilling. Potential takes could occur if individuals of these species are present in the ensonified zone when in-water construction is under way.

The takes from Level B harassment will be due to potential behavioral disturbance. No injury, serious injury, or mortality is anticipated given the nature of the activity and measures designed to minimize the possibility of serious injury to marine mammals. These noise exposures may cause behavioral modification to a small number of each affected marine mammal species. However, the City's proposed activities are fairly localized and of short duration, and the noise exposures are therefore expected to be localized and short-term. The entire project area is limited to the transient float area and its immediate surroundings with only a small band extending out to Woody Island. Actions covered under the Authorization would include extracting 19 12-inch steel piles and installing 12 24-inch steel piles to support the replacement float and gangway. Specifically, the use of impact driving will be limited to an estimated maximum of one hour over the course of 12 days of construction, and will likely require less time. Each 24-inch pile will require about two to five blows of an impact hammer to confirm that piles are set into bedrock for a maximum time expected of three minutes of impact hammering per pile. Vibratory driving will be necessary for an estimated maximum of eight hours and down-hole drilling will require a maximum of 48 hours. The likelihood that marine mammals will be detected by trained observers is high under the environmental conditions described for the reconstruction of the transient float. Therefore, the proposed mitigation and monitoring measures are expected to reduce the likelihood of injury and behavior exposures.

No important feeding and/or reproductive areas for marine mammals are known to be near the proposed action area. The project also is not expected to have significant adverse effects on affected marine mammals' habitat, including Steller sea lion critical habitat. The project activities would not modify existing marine mammal habitat. The activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammals' foraging opportunities in a limited portion of the foraging range; but, because of the short duration of the activities and the relatively small area of the habitat that may be affected, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

Sea lions are common in the Kodiak harbor area the possibility exists that some of these sea lions are already hearing-impaired or deaf (Wynne 2014). Fishermen have been known to protect their gear and catches by using ''seal bombs'' in an effort to disperse sea lions away from fishing gear. Sound levels produced by seal bombs are well above levels that are known to cause TTS (temporary loss of hearing), and Permanent Threshold Shift (PTS, partial or full loss of hearing) in marine mammals (Wynne 2014). The use of seal bombs requires appropriate permits from the Bureau of Alcohol, Tobacco, Firearms and Explosives. Although no studies have been published that document hearing-impaired sea lions in the area, this possibility is important to note as it pertains to mitigation measures that will be effective for this project.

Sea lions in the Kodiak harbor area are habituated to fishing vessels and are skilled at gaining access to fish. It is likely that some of the same animals follow local vessels to the nearby fishing grounds and back to town. It is also likely that hearing-impaired or deaf sea lions are among the sea lions that attend the seafood processing facility nearby the transient float construction site. It is not known how a hearing-impaired or deaf sea lion would respond to typical mitigation efforts at a construction site such as ramping up of pile-driving equipment. It is also unknown whether a hearing-impaired or deaf sea lion would avoid pile-driving activity, or whether such an animal might approach closely, without responding to or being impacted by the noise level. Therefore, any additional auditory injury associated with the transient float project would be unlikely.

Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.,* Thorson and Reyff 2006; Lerma 2014). Most likely, individuals will simply move away from the sound source and be temporarily displaced from the areas of pile driving, although even this reaction has been observed primarily only in association with impact pile driving. In response to vibratory driving, pinnipeds (which may become somewhat habituated to human activity in industrial or urban waterways) have been observed to orient towards and sometimes move towards the sound. The pile extraction and driving activities analyzed here are similar to, or less impactful than, numerous construction activities conducted in other similar locations, including the nearby Pier 1 Kodiak ferry terminal (approximately 100 m away), which have taken place with no reported injuries or mortality to marine mammals, and no known long-term adverse consequences from behavioral harassment. Repeated exposures of individuals to levels of sound that may cause Level B harassment are unlikely to result in hearing impairment or to significantly disrupt foraging behavior. Thus, even repeated Level B harassment of some small subset of the overall stock is unlikely to result in any significant realized decrease in fitness for the affected individuals, and thus would not result in any adverse impact to the stock as a whole.

In summary, this negligible impact analysis is founded on the following factors: (1) The possibility of non-auditory injury, serious injury, or mortality may reasonably be considered discountable; (2) the anticipated incidents of Level B harassment consist of, at worst, temporary modifications in behavior; (3) the short duration of in-water construction activities (12 days), and; (4) the presumed efficacy of the proposed mitigation measures in reducing the effects of the specified activity to the level of least practicable impact. In combination, we believe that these factors, as well as the available body of evidence from other similar activities, demonstrate that the potential effects of the specified activity will have only short-term effects on individuals. The specified activity is not expected to impact rates of recruitment or survival and will therefore not result in population-level impacts.

Based on the analysis contained herein of the likely effects of the specified activity 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 City's Kodiak transient float replacement project will have a negligible impact on the affected marine mammal species or stocks.

Small Numbers Analysis

Table 7 presents the number of animals that could be exposed to received noise levels that could cause Level A and Level B harassment for the proposed work at the transient float project site. Our analysis shows that between <1 percent—2.39 percent of the populations of affected stocks that could be taken by harassment. Therefore, the numbers of animals authorized to be taken for all species would be considered small relative to the relevant stocks or populations even if each estimated taking occurred to a new individual—an extremely unlikely scenario. For pinnipeds, especially Steller sea lions, occurring in the vicinity of the transient float, there will almost certainly be some overlap in individuals present day-to-day, and these takes are likely to occur only within some small portion of the overall regional stock.

TABLE 7—ESTIMATED NUMBERS AND PERCENTAGE OF STOCK THAT MAY BE EXPOSED TO LEVEL A AND B HARASSMENT

Species	Proposed authorized Level A and Level B takes	Stock abundance estimate	Percentage of total stock (%)
Steller sea lion (*Eumatopias jubatus*)			
wDPS	480	49,497	0.97
Harbor seal (*Phoca vitulina*)			
South Kodiak stock	48	19,199	0.25
Harbor porpoise (*Phocoena phocoena*)			
Gulf of Alaska stock	24	31,046	0.08
Dall's porpoise (*Phocoenoides dalli*)			
Alaska stock	42	83,400	0.05
Killer whale (*Orcinus orca*)			
Eastern North Pacific Alaska Resident stock	14	2,347	0.6
Eastern North Pacific Gulf of Alaska, Aleutian Islands, and Bering Sea stock		587	2.39
Humpback whale (*Megaptera novaeangliae*)			
Central North Pacific Stock	6	10,103	0.06
Western North Pacific Stock		1,107	0.54

Based on the analysis contained herein NMFS preliminarily finds that small numbers of marine mammals will be taken relative to the populations of the affected species or stocks.

Impact on Availability of Affected Species for Taking for Subsistence Uses

Alaska Natives have traditionally harvested subsistence resources in the Kodiak area for many hundreds of years, particularly Steller sea lions and harbor seals. No traditional subsistence hunting areas are within the project vicinity, however; the nearest haulouts and rookeries for Steller sea lions and harbor seals are the Long Island, Cape Chiniak, and Ugak Island haul-outs and the Marmot Island rookery, many miles away. These locations are, respectively 4, 13, 25 and 28 nmi distant from the project area. Since all project activities will take place within the immediate vicinity of the transient float site, the project will not have an adverse impact on the availability of marine mammals for subsistence use at locations farther away. No disturbance or displacement of sea lions or harbor seals from traditional hunting areas by activities associated with the transient project is expected. No changes to availability of subsistence resources will result from transient float replacement project activities.

Endangered Species Act (ESA)

There are two marine mammal species that are listed as endangered under the ESA with confirmed or possible occurrence in the study area: the WNP DPS and Mexico DPS of humpback whale and the western DPS of Steller sea lion. The project location is also within critical habitat of two major haulouts closest to the project area: Long Island and Cape Chiniak, which are approximately 4.6 nmi (8.5 km) and 13.8 nmi (25.6 km) away from the project site, respectively. There are no rookeries within 20 mi of the project location. In October 2016, NMFS initiated formal consultation under Section 7 of the ESA. The Biological Opinion will analyze the effects to ESA listed species, including Steller sea lions and humpback whales, as well as critical habitat.

National Environmental Policy Act (NEPA)

NMFS is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) and will consider comments submitted in response to this notice as part of that process. The EA will be posted at *http://www.nmfs.noaa.gov/pr/permits/incidental/construction.htm* once it is finalized.

Proposed Incidental Harassment Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to the City of Kodiak for the Kodiak Transient Float Replacement Project, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. The proposed IHA language is provided next.

1. This Incidental Harassment Authorization (IHA) is valid from January 1, 2017 through December 31, 2017.

2. This Authorization is valid only for in-water construction work associated with the Kodiak Transient Float Replacement Project.

3. General Conditions

(a) A copy of this IHA must be in the possession of the City, its designees, and work crew personnel operating under the authority of this IHA.

(b) The species authorized for taking include harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), killer whale (*Orcinus orca*), Humpback whale (*Megaptera novaeangliae*), Steller sea lion (*Eumatopius jubatus),* and harbor seal (*Phoca vitulina richardii*).

(c) The taking, by Level B harassment only, is limited to the species listed in condition 3(b).

(d) The taking by injury (Level A harassment), serious injury, or death of any of the species listed in condition 3(b) or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA.

(e) The City shall conduct briefings between construction supervisors and crews, marine mammal monitoring team, and staff prior to the start of all in-water pile driving, and when new personnel join the work.

4. Mitigation Measures

The holder of this Authorization is required to implement the following mitigation measures:

(a) *Time Restriction:* For all in-water pile driving activities, the City shall operate only during daylight hours when visual monitoring of marine mammals can be conducted. To minimize impacts to pink salmon (*Oncorhynchus gorbuscha*) fry and coho salmon (*O. kisutch*) smolt, the City will refrain from impact pile driving from May 1, 2017 through June 30, 2017. If work occurs from May 1 through June 30, it will occur in evenings during daylight hours, after the 12-hour period that begins civil dawn.

(b) *Establishment of Level B Harassment (ZOI):* Before the commencement of in-water pile driving activities, the City shall establish Level B behavioral harassment ZOI where received underwater sound pressure levels (SPLs) are higher than 120 dB (rms) re 1 μPa for and non-pulse sources (vibratory hammer and drilling) and 160 dB (rms) for pulse sources (impact hammer). The ZOI delineates where Level B harassment would occur. The Level B harassment area extends out to 6,846 m for down-hole drilling (rounded to 7000 m), 821 m for vibratory driving (rounded to 900 m), and 183 m for impact driving (rounded to 200 m).

(c) Establishment of Shutdown Zone

(i) For all pile driving activities, the City will establish shutdown zones. Shutdown zones are intended to contain the area in which SPLs equal or exceed the acoustic injury criteria for each marine mammal hearing group, with the purpose being to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area), thus preventing injury of marine mammals. The shutdown zones would be 10 m for Steller sea lions and killer whales, 100 m for humpback whales, harbor porpoise, and Dall's porpoise, and 50 m harbor seals.

(d) The Level A and Level B harassment zones will be monitored throughout the time required to install or extract a pile. If a harbor seal, Steller sea lion, harbor porpoise, Dall's porpoise, killer whale, or humpback whale is observed entering the Level B harassment zone, a Level B exposure will be recorded and behaviors documented. That pile segment will be completed without cessation, unless the animal approaches the Level A shutdown zone. Pile installation or extraction will be halted immediately before the animal enters the Level A zone.

(e) If any marine mammal species other than those listed in condition 3(b) enters or approaches the Level B zone (including, but not limited to grey whales and fin whales), all activities will shut down.

(f) Use of Ramp Up/Soft Start

(i) The project will utilize soft start techniques for all impact pile driving. We require the City to initiate sound from impact hammers with an initial set of three strikes at reduced energy, followed by a 1-minute waiting period, then two subsequent three strike sets.

(ii) Soft start will be required at the beginning of each day's impact pile driving work and at any time following a cessation of pile driving of 30 minutes or longer.

(iii) If a marine mammal is present within the shutdown zone, ramping up will be delayed until the animal(s) leaves the Level A harassment zone. Activity will begin only after the MMO has determined, through sighting, that the animal(s) has moved outside the Level A harassment zone.

(iv) If a Steller sea lion, harbor seal, harbor porpoise, Dall's porpoise, killer whale, or humpback whale is present in the Level B harassment zone, ramping up will begin and a Level B take will be documented. Ramping up will occur when these species are in the Level B harassment zone whether they entered the Level B zone from the Level A zone, or from outside the project area.

(v) If any marine mammal other than Steller sea lions, harbor seal, harbor porpoise, Dall's porpoise, killer whale, or humpback whale is present in the Level B harassment zone, ramping up will be delayed until the animal(s) leaves the zone. Ramping up will begin only after the MMO has determined, through sighting, that the animal(s) has moved outside the harassment zone.

(g) *Pile Caps:* Pile caps or cushions will be used during all impact pile-driving activities.

(h) Standard Mitigation Measures

(i) For in-water heavy machinery work other than pile driving (*e.g.,* standard barges, tug boats, barge-mounted excavators, or clamshell equipment used to place or remove material), if a marine mammal comes within 10 meters, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.

(i) The City shall establish monitoring locations as described below.

5. Monitoring and Reporting

The holder of this Authorization is required to report all monitoring conducted under the IHA within 90 calendar days of the completion of the marine mammal monitoring.

(a) Visual Marine Mammal Monitoring and Observation

(i) At least one individual meeting the minimum qualifications below will monitor the shutdown zones and Level A and Level B harassment zones during impact and vibratory pile driving, and down-hole drilling.

Requirements when choosing MMOs for construction actions are as follows:

a. Independent observers (*i.e.,* not construction personnel) are required.

b. At least one observer must have prior experience working as an observer.

c. Other observers may substitute education (undergraduate degree in biological science or related field) or training for experience.

d. Where a team of three or more observers are required, one observer should be designated as lead observer or monitoring coordinator. The lead observer must have prior experience working as an observer.

e. We will require submission and approval of observer CVs.

Qualified MMOs are trained biologists, with the following minimum qualifications:

a. Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target;

b. Ability to conduct field observations and collect data according to assigned protocols

c. Experience or training in the field identification of marine mammals, including the identification of behaviors

d. Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations

e. Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined shutdown zone; and marine mammal behavior

f. Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

(ii) During drilling, pile driving, and extraction, the shutdown zone, as described in 4(b), will be monitored and maintained. Pile installation or extraction will not commence or will be suspended temporarily if any marine mammals are observed within or approaching the area of potential disturbance.

(iii) The area within the Level B harassment threshold for pile driving and extraction will be monitored by observers stationed to provide adequate view of the harassment zone. Marine mammal presence within this Level B harassment zone, if any, will be monitored. Pile driving activity will not be stopped if marine mammals are found to be present. Any marine mammal documented within the Level B harassment zone would constitute a Level B take (harassment), and will be recorded and reported as such.

(iv) The individuals will scan the waters within each monitoring zone activity using binoculars, spotting scopes and visual observation.

(v) If waters exceed a sea-state which restricts the observers' ability to make observations within the marine mammal shutdown zones (*e.g.* excessive wind or fog), in-water construction activities will cease until conditions allow monitoring to resume.

(vi) The waters will be scanned 30 minutes prior to commencing pile driving at the beginning of each day, and prior to commencing pile driving after any stoppage of 30 minutes or greater. If marine mammals enter or are observed within the designated marine mammal shutdown zone during or 30 minutes prior to impact pile driving, the monitors will notify the on-site construction manager to not begin until the animal has moved outside the designated radius.

(vii) The waters will continue to be scanned for at least 30 minutes after pile driving has completed each day.

(b) Data Collection

(i) Observers are required to use approved data forms. Among other pieces of information, the City will record detailed information about any implementation of shutdowns, including the distance of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any. In addition, the City will attempt to distinguish between the number of individual animals taken and the number of incidents of take. At a minimum, the following information be collected on the sighting forms:

a. Date and time that monitored activity begins or ends;

b. Construction activities occurring during each observation period;

c. Weather parameters (*e.g.,* percent cover, visibility);

d. Water conditions (*e.g.,* sea state, tide state);

e. Species, numbers, and, if possible, sex and age class of marine mammals;

f. Description of any observable marine mammal behavior patterns, including bearing and direction of travel and distance from pile driving activity;

g. Distance from pile driving activities to marine mammals and distance from the marine mammals to the observation point;

h. Locations of all marine mammal observations; and

i. Other human activity in the area.

(c) Reporting Measures

(i) In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA, such as an injury (Level A harassment), serious injury or mortality (*e.g.,* ship-strike, gear interaction, and/or entanglement), the City would immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinators. The report would include the following information:

a. Time, date, and location (latitude/longitude) of the incident;

b. Name and type of vessel involved;

c. Vessel's speed during and leading up to the incident;

d. Description of the incident;

e. Status of all sound source use in the 24 hours preceding the incident;

f. Water depth;

g. Environmental conditions (*e.g.,* wind speed and direction, Beaufort sea state, cloud cover, and visibility);

h. Description of all marine mammal observations in the 24 hours preceding the incident;

i. Species identification or description of the animal(s) involved;

j. Fate of the animal(s); and

k. Photographs or video footage of the animal(s) (if equipment is available).

Activities would not resume until NMFS is able to review the circumstances of the prohibited take. NMFS would work with the City to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. The City would not be able to resume their activities until notified by NMFS via letter, email, or telephone.

(ii) In the event that the City discovers an injured or dead marine mammal, and the lead MMO determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.,* in less than a moderate state of decomposition as described in the next paragraph), the City would immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Alaska Stranding Hotline and/or by email to the Alaska Regional Stranding Coordinators. The report would include the same information identified in the paragraph above. Activities would be able to continue while NMFS reviews the circumstances of the incident. NMFS would work with the City to determine whether modifications in the activities are appropriate.

(iii) In the event that the City discovers an injured or dead marine mammal, and the lead MMO determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.,* previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), the City would report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the NMFS Alaska Stranding Hotline and/or by email to the Alaska Regional Stranding Coordinator, within 24 hours of the discovery. The City would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network.

6. This Authorization may be modified, suspended or withdrawn if the holder fails to abide by the conditions prescribed herein, or if NMFS determines the authorized taking is having more than a negligible impact on the species or stock of affected marine mammals.

TABLE 1—AUTHORIZED TAKE NUMBERS

Species	Level A injury takes	Level B harassment takes	Total
Steller sea lion	0	480	480
Harbor seal	0	48	48
Harbor porpoise	0	24	24
Dall's porpoise	0	42	42
Killer whale	0	14	14
Humpback whale	0	6	6
Total	0	614	614

Request for Public Comments

NMFS requests comment on our analysis, the draft authorization, and any other aspect of the Notice of Proposed IHA for the City's Kodiak Transient Float Replacement Project. Please include with your comments any supporting data or literature citations to help inform our final decision on the City's request for an MMPA authorization.

Dated: November 4, 2016.

Donna S. Wieting,

Director, Office of Protected Resources, National Marine Fisheries Service.

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