BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XD978

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Rehabilitation of Jetty A at the Mouth of the Columbia River

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

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

SUMMARY: NMFS has received a request from the U.S. Army Corps of Engineers, Portland District (Corps) for authorization to take marine mammals incidental to the rehabilitation of jetty system at the mouth of the Columbia River (MCR): North Jetty, South Jetty, and Jetty A. The Corps is requesting an Incidental Harassment Authorization (IHA) for the first season of pile installation and removal at Jetty A only.

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

ADDRESSES: Comments on the application should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Physical comments should be sent to 1315 East-West Highway, Silver Spring, MD 20910 and electronic comments should be sent *to ITP.Pauline@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments received

electronically, including all attachments, must not exceed a 25-megabyte file size. Attachments to electronic comments will be accepted in Microsoft Word or Excel or Adobe PDF file formats only. All comments received are a part of the public record and will generally be posted to the Internet at *http://www.nmfs.noaa.gov/pr/permits/incidental/construction.htm* without change. All personal identifying information (e.g., name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

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

SUPPLEMENTARY INFORMATION:

Availability

An electronic copy of the Corps' 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 February 13, 2015, NMFS received an application from the Corps for the taking of marine mammals incidental to the rehabilitation of Jetty A at the mouth of the Columbia River (MCR). On June 9, 2015 NMFS received a revised application. NMFS determined that the application was adequate and complete on June 12, 2015. The Corps proposes to conduct in-water work that may incidentally harass marine mammals (i.e., pile driving and removal). This IHA would be valid from May 1, 2016 through April 30, 2017.

The use of vibratory pile driving is expected to produce underwater sound at levels that have the potential to result in behavioral harassment of marine mammals. Species with the

expected potential to be present during the project timeframe include killer whale (*Orcinus orca*), Steller sea lion (*Eumatopius jubatus*), gray whale (*Eschrichtius robustus*), harbor porpoise (*Phocoena phocoena*), California sea lion (*Zalophus californianus)*, and harbor seal (*Phoca vitulina richardii*).

Description of the Specified Activity

Overview

The Corps is seeking an IHA for the first year of pile installation and, possibly, removal work at Jetty A related to construction and maintenance of a barge offloading facility. The barge facility will be used for activities associated with the rehabilitation of Jetty A. The Corps is seeking this authorization by the end of August 2015 for contract bid schedule reasons. Because the work may extend beyond two seasons the Corps will request an LOA for any additional years of pile maintenance and removal at Jetty A. Jetty A is not a haul-out site for pinnipeds so pile installation and removal were the only activities identified as having the potential to adversely affect marine mammals at Jetty A.

Dates and Duration

Work on the first year of pile installation may begin as early as May 2016 and would extend through September 2017. Work is anticipated for two seasons stone placement for head stabilization and trunk repairs starting in 2016. Because the work may extend to two seasons the Corps will be requesting an LOA for the second year of pile maintenance and removal at Jetty A.

The scheduled program of repair and rehabilitation priorities are described in detail in Section 1 of the Corps' IHA application. The sequence and overall timing for remaining work requiring an IHA and future LOA at the three MCR jetties include:

1. Jetty A Scheduled Repairs and Head Stabilization will require an IHA and future LOA for pile installation of an offloading facilities. Construction and stone placement will likely occur in 2016 and 2017. The Corps will request an LOA after the IHA expires to cover additional years of pile maintenance and removal.

2. North Jetty Scheduled Repair and Head Stabilization will require an LOA in the future for pile installation and removal at offloading facility. Construction/placement is planned for 2016-2019.

3. South Jetty Interim Repair and Head Determination will require an LOA for pile installation and removal at two barge offloading facilities. This work would be covered under a future LOA.

The work season generally extends from April through October, with extensions, contractions, and additional work windows outside of the summer season varying by weather patterns. To avoid the presence of Southern resident killer whales, the Corps will prohibit pile installation for offloading facilities from October 1 until on or after May 1 since that is their primary feeding season when they may be present at the MCR plume. Installation would occur from May 1 to September 30 each year.

Specified Geographic Region

This activity will take place at the three MCR jetties in Pacific County, Washington, and Clatsop County, Oregon. The scheduled program of repair and rehabilitation priorities are described and illustrated in Section 1 of the application.

Detailed Description of Activities

Jetty A Scheduled Repair would occur as part of the Corps' Major Rehabilitation program for the jetties. Scheduled repairs would address the loss of cross-section, reduce future cross-section

instability, and stabilize the head (terminus). Scheduled cross-section repairs are primarily above mean lower low water (MLLW), with a majority of stone placement not likely to extend below -5 feet MLLW. The jetty head (Southern-most end section) would be stabilized at approximately station (STA) 89+00 with large armoring stone placed on relic jetty stone that is mostly above MLLW. Stations (STA) indicate lineal distance along the jetty relative to a fixed reference point (0+00) located at the landward-most point on the jetty root (See Application Figure 2).

Construction of an offloading facility will be necessary to transport materials to the Jetty A project site. This construction would require dredging and pile installation. There is a small chance that delivery and placement could occur exclusively via overland methods. If such were the case, the Corps would not have a need an IHA.

Four offloading facilities will eventually be required for completion of entire project. However, only construction of the first facility would be covered under the proposed Authorization. Construction of all four offloading facilities combined will require up to 96 wood or steel piles and up to 373 sections of Z-piles, H-piles, and sheet pile to retain rock fill. A vibratory hammer will be used for pile installation due to the soft sediments (sand) in the project area and only untreated wood will be used, where applicable. No impact driving will be necessary under this Authorization. The piles will be located within 200 feet of the jetty structure. The presence of relic stone may require locating the piling further from the jetty so that use of this method is not precluded by the existing stone. The dolphins/Z- and H-piles would be composed of either untreated timber or steel piles installed to a depth of approximately 15 to 25 feet below grade in order to withstand the needs of off-loading barges and heavy construction equipment. Because vibratory hammers will be used in areas with velocities greater than 1.6 feet per second, the need for hydroacoustic attenuation is not an anticipated issue.

Piling will be fitted with pointed caps to prevent perching by piscivorous birds to minimize opportunities for avian predation on listed species. Some of the pilings and offloading facilities will be removed at the end of the construction period.

Pile installation is assumed to occur for about 10 hours a day, with a total of approximately 15 piles installed per day. Each offloading facility would have about ¼ of the total piles mentioned. As noted above, up to 96 piles could be installed, and up to 373 sections of sheet pile to retain rock fill. This is a total of 469 initial installation and 469 removal events, over the span of about 67 days. In order to round the math, the NMFS has assumed 68 days, so that each of the four offloading facilities takes about 17 days total for installation and removal. This is likely to be the maximum number of days for pile installation at Jetty A. The Corps is still determining whether or not to remove some or all of these offloading facilities once jetty rehabilitation work is completed. It is possible that portions of these facilities may not survive ocean conditions. Longer-term offloading facilities at South and North Jetties may need to be repaired if used more than one season. The Corps will also be conducting post-construction pedestrian surveys along the jetties, and will have construction activities for about four seasons on the South Jetty.

Note that only a portion of the activities described above will be covered under the IHA. Actions covered under the authorization would include installing a maximum of 24 piles for use as dolphins and a maximum of 93 sections of Z or H piles for retention of rock fill over 17 days. The piles would be a maximum diameter of 24 inches and would only be installed by vibratory driving method. The possibility exists that smaller diameter piles may be used but for this analysis it is assumed that 24 inch piles will be driven.

Description of Marine Mammals in the Area of the Specified Activity

Marine mammals known to occur in the Pacific Ocean offshore at the MCR include whales, orcas, dolphins, porpoises, sea lions, and harbor seals. Most cetacean species observed by Green and others (1992) occurred in Pacific slope or offshore waters (600 to 6,000 feet in depth). Harbor porpoises (*Phocoena phocoena)* and gray whales (*Eschrichtius robustus)* were prevalent in shelf waters less than 600 feet in depth. Orcas are known to feed on Chinook salmon at the MCR, and humpback whales (*Megaptera novaeangliae*) may transit through the area offshore of the jetties. While humpbacks have been observed offshore they are unlikely to be found inside of the jetty system. The marine mammal species potentially present in the activity area are shown in Table 1.

Pinniped species that occur in the vicinity of the jetties include Pacific harbor seals (*Phoca vitulina richardsi*), California sea lions (*Zalophus californianus*), and Steller sea lions (*Eumetopias jubatus*). Their use is primarily confined to the South Jetty. According to the Washington Department of Fish and Wildlife (WDFW) aerial survey counts from 2000-2014, there are no records for harbor seals, Steller sea lions or California sea lions using Jetty A (WDFW 2014).

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 1. Marine Mammal Species Potentially Present in the Project Area

Species	Stock(s) Abundance Estimate [1]	ESA Status	MMPA* Status	Frequency of Occurrence [3]
Killer Whale (*Orcinus orca*) *Eastern N. Pacific, Southern Resident Stock*	85	Endangered	Depleted and Strategic	Infrequent/ Rare
Killer Whale (*Orcinus orca*) *Eastern N. Pacific, West Coast Transient Stock*	243	--	Non-depleted	Rare
Gray Whale (*Eschrichtius robustus*)	18,017 (173)	Delisted/	Non-depleted	Rare

Eastern North Pacific Stock, (Pacific Coast Feed Group)		Recovered (1994)		
Harbor Porpoise (*Phocoena phocoena*) *Northern Oregon/Washington Coast Stock*	21,487	--	Non-depleted	Likely
Steller Sea Lion (*Eumetopias jubatus*) *Eastern U.S. Stock/DPS***	63,160 – 78,198	Delisted/ Recovered (2013)	Depleted and Strategic [2]	Likely
California Sea Lion (*Zalophus californianus*) *U.S. Stock*	296,750	--	Non-depleted	Likely
Harbor Seal (*Phoca vitulina richardii*) *Oregon and Washington Stock*	24,732[4]	--	Non-depleted	Seasonal

[1] NOAA/NMFS 2014 marine mammal stock assessment reports at http://www.nmfs.noaa.gov/pr/sars/species.htm.
[2] May be updated based on the recent delisting status.
[3] Frequency defined here in the range of:

- Rare – Few confirmed sightings, or the distribution of the species is near enough to the area that the species could occur there.
- Infrequent – Confirmed, but irregular sightings.
- Likely – Confirmed and regular sightings of the species in the area year-round.
- Seasonal – Confirmed and regular sightings of the species in the area on a seasonal basis.

[4] Data is 8 years old. No current abundance estimates exist.
* MMPA = Marine Mammal Protection Act
** DPS = Distinct population segment.

Cetaceans

Killer Whale

During construction of the project, it is possible that two killer whale stocks, the Eastern North Pacific Southern resident and Eastern North Pacific West Coast transient stocks could be in the nearshore vicinity of the MCR. However, based on the restrictions to the work window for pile installation, it is unlikely that either West Coast transient or Southern resident killer whales will be present in the area during the period of possible acoustic effects.

Since the first complete census of this stock in 1974 when 71 animals were identified, the number of Southern resident killer whales has fluctuated annually. Between 1974 and 1993 the Southern Resident stock increased approximately 35%, from 71 to 96 individuals (Ford *et al.* 1994), representing a net annual growth rate of 1.8% during those years. Following the peak census count of 99 animals in 1995, the population size has fluctuated and currently stands at 85 animals as of the 2013 census (Carretta *et al.* 2014).

The Southern resident killer whale population consists of three pods, designated J, K, and L pods, that reside from late spring to fall in the inland waterways of Washington State and British Columbia (NMFS 2008a). During winter, pods have moved into Pacific coastal waters and are known to travel as far south as central California. Winter and early spring movements and distribution are largely unknown for the population. Sightings of members of K and L pods in Oregon (L pod at Depoe Bay in April 1999 and Yaquina Bay in March 2000, unidentified Southern residents at Depoe Bay in April 2000, and members of K and L pods off of the Columbia River) and in California (17 members of L pod and four members of K pod at Monterey Bay in 2000; L pod members at Monterey Bay in March 2003; L pod members near the Farallon Islands in February 2005 and again off Pt. Reyes in January 2006) have considerably extended the Southern limit of their known range (NMFS 2008a). Sightings of Southern resident killer whales off the coast of Washington, Oregon, and California indicate that they are utilizing resources in the California Current ecosystem in contrast to other North Pacific resident pods that exclusively use resources in the Alaskan Gyre system (NMFS 2008a).

During the 2011 Section 7 Endangered Species Act (ESA) consultation, NMFS indicated Southern resident killer whales are known to feed on migrating Chinook salmon in the Columbia River plume during the peak salmon runs in March through April. Anecdotal evidence indicates that orcas historically were somewhat frequent visitors in the vicinity of the estuary, but have been less common in current times (Wilson 2015). However, there is low likelihood of them being in close proximity to any of the pile installation locations, and there would be minimal overlap of their presence during the peak summer construction season. To further avoid any overlap with Southern resident killer whales use during pile installation, the Corps would limit

the pile installation window to start on or after May 1 and end after September 30 of each year to avoid peak adult salmon runs.

Southern Resident killer whales were listed as endangered under the ESA in 2005 and consequently the stock is automatically considered as a "strategic" stock under the MMPA. This stock was considered "depleted" prior to its 2005 listing under the ESA.

The West Coast transient stock ranges from Southeast Alaska to California. Preliminary analysis of photographic data resulted in the following minimum counts for 'transient' killer whales belonging to the West Coast Transient Stock (NOAA 2013b). Over the time series from 1975 to 2012, 521 individual transient killer whales have been identified. Of these, 217 are considered part of the poorly known "outer coast" subpopulation and 304 belong to the well-known "inner coast" population. However, of the 304, the number of whales currently alive is not certain. A recent mark-recapture estimate that does not include the "outer coast" subpopulation or whales from California for the west coast transient population resulted in an estimate of 243 in 2006. This estimate applies to the population of West Coast transient whales that occur in the inside waters of southeastern Alaska, British Columbia, and northern Washington. Given that the California transient numbers have not been updated since the publication of the catalogue in 1997 the total number of transient killer whales reported above should be considered as a minimum count for the West Coast transient stock (NOAA 2014a)

For this project, it is possible only the inner-coast species would be considered for potential exposure to acoustic effects. However, they are even less likely to be in the project area than Southern resident killer whales, especially outside of the peak salmon runs. The Corps is avoiding pile installation work during potential peak feeding timeframes in order to further

reduce the potential for acoustic exposure. It is possible, however, that West Coast transients come in to feed on the pinniped population hauled out on the South Jetty.

This stock of killer whales is not designated as "depleted" under the MMPA nor are they listed as "threatened" or "endangered" under the ESA. Furthermore, the West Coast transient stock of killer whales is also not classified as a strategic stock

Gray Whale

During summer and fall, most gray whales in the Eastern North Pacific stock feed in the Chukchi, Beaufort and northwestern Bering Seas. An exception is the relatively small number of whales (approximately 200) that summer and feed along the Pacific coast between Kodiak Island, Alaska and northern California (Carretta *et al.* 2014), also known as the "Pacific Coast Feeding Group." The minimum population estimate for the Eastern North Pacific stock using the 2006/2007 abundance estimate of 19,126 and its associated coefficient of variation (CV) of 0.071 is 18,017 animals. The minimum population estimate for Pacific Coast Feeding Group gray whales is calculated as the lower 20th percentile of the log-normal distribution of the 2010 mark-recapture estimate, or 173 animals (Carretta *et al.* 2014). If gray whales were in the vicinity of MCR, the Pacific Coast Feeding Group would be the most likely visitor. Anecdotal evidence indicates they have been seen at MCR, but are not a common visitor, as they mostly remain in the vicinity of the offshore shelf-break (Griffith 2015).

In 1994, the Eastern North Pacific stock of gray whales was removed from the Endangered Species List as it was no longer considered "endangered" or "threatened" under the ESA. NMFS has not designated gray whales as "depleted" under the MMPA. The Eastern North Pacific gray whale stock is not classified as "strategic."

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.

Harbor porpoise are known to occur year-round in the inland transboundary waters of Washington and British Columbia, Canada and along the Oregon/Washington coast. Aerial survey data from coastal Oregon and Washington, collected during all seasons, suggest that harbor porpoise distribution varies by depth. Although distinct seasonal changes in abundance along the west coast have been noted, and attributed to possible shifts in distribution to deeper offshore waters during late winter seasonal movement patterns are not fully understood. Harbor porpoises are sighted regularly at the MCR (Griffith 2015, Carretta *et al.* 2014).

According to the online database, Ocean Biogeographic Information System, Spatial Ecological Analysis of Megavertebrate Populations (Halpin 2009 at OBIS-SEAMAP 2015), 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 or six individuals, though for feeding or migration they may aggregate into large, loose groups of 50 to several hundred animals. Behavior tends to be inconspicuous, compared to most dolphins, and they feed by seizing prey which consists of wide variety of fish and cephalopods ranging from benthic or demersal.

The Northern Oregon/Washington coast stock of harbor porpoise inhabits the waters near the proposed project area. The population estimate for this stock is calculated at 21,847 with a minimum population estimate of 15,123. (Carretta *et al.,* 2014)

Harbor porpoise are not listed as "depleted" under the MMPA, listed as "threatened" or "endangered" under the Endangered Species Act, or classified as "strategic."

Pinnipeds

Steller Sea Lion

The Steller sea lion is a pinniped and the largest of the eared seals. Steller sea lion populations that primarily occur east of 144° W (Cape Suckling, Alaska) comprise the Eastern Distinct Population Segment (DPS), which was de-listed and removed from the list of Endangered Species List on November 4, 2013 (78 FR 66140). This stock is found in the vicinity of MCR. The population west of 144° W longitude comprises the Western DPS, which is listed as endangered, based largely on over-fishing of the seal's food supply.

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 MCR South Jetty is used by Steller sea lions for hauling out and is not designated critical habitat. Use occurs chiefly at the concrete block structure at the terminus, or head of the jetty, and at the emergent rubble mound comprised of the eroding jetty trunk near the terminus.

Previous monthly averages between 1995 and 2004 for Steller sea lions hauled-out at the South Jetty head ranged from about 168 to 1,106 animals. More recent data from ODFW from 2000-2014 reflects a lower frequency of surveys, and numbers ranged from zero animals to 606 Steller sea lions (ODFW 2014). More frequent surveys by WDFW for the same time frame

(2000-2014) put the monthly range at 177 to 1,663 animals throughout the year. According to ODFW (2014), most counts of animals remain at or near the jetty tip.

Steller sea lions are present, in varying abundances, all year as is shown in the Corps application. Abundance is typically lower as the summer progresses when adults are at the breeding rookeries. Steller sea lions are most abundant in the vicinity during the winter months and tend to disperse elsewhere to rookeries during breeding season between May and July. Abundance increases following the breeding season. However, this is not always true as evidenced by a flyover count of the South Jetty on May 23, 2007 where 1,146 Steller sea lions were observed on the concrete block structure and none on the rubble mound (ODFW 2007). Those counts represent a high-use day on the South Jetty. According to ODFW (2014), during the summer months it is not uncommon to have between 500-1,000 Steller sea lions present, the majority of which are immature males and females (no pups or pregnant females). All population age classes, and both males and females, use the South Jetty to haul out. Only non-breeding individuals are typically found on the jetty during May-July, and a greater percentage of juveniles are present. There is probably a lot of turnover in sea lion numbers using the jetty. That is, the 100 or so sea lions hauled out one week might not be the same individuals hauled out the following week. Recent ODFW and WDFW survey data continue to support these findings. The most recent estimate from 2007 put the populations between 63,160 and 78,198.(Allen and Angliss, 2013). The best available information indicates the eastern stock of Steller sea lion increased at a rate of 4.18% per year between 1979 and 2010 based on an analysis of pup counts in California, Oregon, British Columbia and Southeast Alaska (Allen and Angliss, 2013).

California Sea Lion

California sea lions are found from the Southern tip of Baja California to southeast Alaska. They breed mainly on offshore islands from Southern California's Channel Islands south to Mexico. Non-breeding males often roam north in spring foraging for food. Since the mid-1980s, increasing numbers of California sea lions have been documented feeding on fish along the Washington coast and – more recently – in the Columbia River as far upstream as Bonneville Dam, 145 miles from the river mouth. The population size of the U.S. stock of California sea lions is estimated at 296,750 animals (Carretta *et al.* 2014). As with Steller sea lions, according to ODFW (2014) most counts of California sea lions are also concentrated near the tip of the jetty, although sometimes haul out about halfway down the jetty. Survey information (2007 and 2014) from ODFW indicates that California sea lions are relatively less prevalent in the Pacific Northwest during June and July, though in the months just before and after their absence there can be several hundred using the South Jetty. More frequent WDFW surveys (2014) indicate greater numbers in the summer, and use remains concentrated to fall and winter months. Nearly all California sea lions in the Pacific Northwest are sub-adult and adult males (females and young generally stay in California). Again, there is probably a lot of turnover in sea lion numbers using the jetty. (ODFW 2014).

California sea lions in the U.S. are not listed as "endangered" or "threatened" under the Endangered Species Act, listed as "depleted" under the MMPA, or classified as "strategic" under the MMPA.

Harbor Seal

Harbor seals range from Baja California, north along the western coasts of the U.S., 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. They haul out on rocks, reefs, beaches, and drifting glacial ice and feed in marine, estuarine, and occasionally fresh waters. Harbor seals generally are non-migratory, with local movements associated with tides, weather, season, food availability, and reproduction. Harbor seals do not make extensive pelagic migrations, though some long distance movement of tagged animals in Alaska (900 km) and along the U.S. west coast (up to 550 km) have been recorded. Harbor seals have also displayed strong fidelity to haulout sites (Carretta *et al.* 2014).

The 1999 harbor seal population estimate for the Oregon/Washington Coast stock was about 24,732 animals. However, the data used was over 8 years old and, therefore, there are no current abundance estimates. Harbor seals are not considered to be "depleted" under the MMPA or listed as "threatened" or "endangered" under the ESA. The Oregon/Washington Coast stock of harbor seals is not classified as a "strategic" stock (Carretta *et al*. 20140).

Further information on the biology and local distribution of these species can be found in the Corps 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/.*

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

This section includes a summary and discussion of the ways that stressors, (e.g. pile driving,) and potential mitigation activities, associated with the rehabilitation of Jetty A at MCR may impact marine mammals and their habitat. The *Estimated Take by Incidental Harassment* section later in this document will include an 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 vibratory pile driving.

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. Representative levels of anthropogenic sound are displayed in Table 2.

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.

Table 2—Representative Sound Levels of Anthropogenic Sources

Sound source	Frequency range (Hz)	Underwater sound level	Reference
Small vessels	250-1,000	151 dB rms at 1 m	Richardson *et al.,* 1995.
Tug docking gravel barge	200-1,000	149 dB rms at 100 m	Blackwell and Greene, 2002.
Vibratory driving of 72-in steel pipe pile	10-1,500	180 dB rms at 10 m	Reyff, 2007.
Impact driving of 36-in steel pipe pile	10-1,500	195 dB rms at 10 m	Laughlin, 2007.
Impact driving of 66-in	10-	195 dB	Reviewed in

cast-in-steel-shell (CISS) pile	1,500	rms at 10 m	Hastings and Popper, 2005.

In-water construction activities associated with the project include vibratory pile driving and removal. There are two general categories of sound types: Impulse and non-pulse (defined in the following). Vibratory pile driving is considered to be continuous or non-pulsed while impact pile driving is considered to be an impulse or pulsed sound type. 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. Note that information related to impact hammers is included here for comparison. The Corps does not intend to employ the use of impact hammers as part of this proposed project. 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.

The likely or possible impacts of the proposed pile driving program in the MCR area on marine mammals could involve both non-acoustic and acoustic stressors. Potential non-acoustic stressors could result from the physical presence of the equipment and personnel. Any impacts to marine mammals are expected to primarily be acoustic in nature. Acoustic stressors could include effects of heavy equipment operation, dredging and disposal actions, and pile installation at Jetty A.

Marine Mammal Hearing

When considering the influence of various kinds of sound on the marine environment, it is necessary to understand that different kinds of marine life are sensitive to different frequencies of sound. Based on available behavioral data, audiograms have been derived using auditory evoked potentials, anatomical modeling, and other data, Southall *et al.* (2007) designate "functional hearing groups" for marine mammals and estimate the lower and upper frequencies of functional hearing of the groups. The functional groups and the associated frequencies are indicated below (though animals are less sensitive to sounds at the outer edge of their functional range and most sensitive to sounds of frequencies within a smaller range somewhere in the middle of their functional hearing range):

- Low frequency cetaceans (13 species of mysticetes): functional hearing is estimated to occur between approximately 7 Hz and 30 kHz;

- 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;
- High frequency cetaceans (eight species of true porpoises, six species of river dolphins, Kogia, the franciscana, and four species of cephalorhynchids): functional hearing is estimated to occur between approximately 200 Hz and 180 kHz;
- Phocid pinnipeds in Water: functional hearing is estimated to occur between approximately 75 Hz and 75 kHz; and
- Otariid pinnipeds in Water: functional hearing is estimated to occur between approximately 100 Hz and 40 kHz.

As mentioned previously in this document, nine marine mammal species (seven cetacean and two pinniped) may occur in the project area. Of the three cetacean species likely to occur in the proposed project area, one is classified as low-frequency cetaceans (i.e., minke), one is classified as a mid-frequency cetacean (i.e., killer whale), and one is classified as a high-frequency cetaceans (i.e., harbor porpoise) (Southall *et al.*, 2007). Additionally, harbor seals are classified as members of the phocid pinnipeds in water functional hearing group while Stellar sea lions and California 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.

Acoustic Impacts

Potential Effects of Pile Driving Sound—The effects of sounds from pile driving might result in 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.*, 2004; Nowacek *et al.*, 2007; Southall *et al.*, 2007). The effects of pile driving on marine mammals are dependent on several factors, including the size, type, and depth of the animal; the depth, intensity, and duration of the pile driving sound; the depth of the water column; the substrate of the habitat; 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 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. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. 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.

In the absence of mitigation, impacts to marine species would be expected to result from physiological and behavioral responses to both the type and strength of the acoustic signature (Viada *et al.*, 2008). The type and severity of behavioral impacts are more difficult to define due to limited studies addressing the behavioral effects of impulse sounds on marine mammals. Potential effects from impulse sound sources can range in severity from effects such as behavioral disturbance or tactile perception to physical discomfort, slight injury of the internal organs and the auditory system, or mortality (Yelverton *et al.*, 1973).

Hearing Impairment and Other Physical Effects—Marine mammals exposed to high intensity sound repeatedly or 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, 2005). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al.,* 2007). Marine mammals depend on acoustic cues for vital biological functions, (e.g., orientation, communication, finding prey, avoiding predators); thus, TTS may result in reduced fitness in survival and reproduction. However, this depends on the frequency and duration of TTS, as well as the biological context in which it occurs. TTS of limited duration, occurring in a frequency range that does not coincide with that used for recognition of important acoustic cues, would have little to no effect on an animal's fitness. Repeated sound exposure that leads to TTS could cause PTS. PTS constitutes injury, but TTS does not (Southall *et al.,* 2007). The following subsections discuss in somewhat more detail the possibilities of TTS, PTS, and non-auditory physical effects.

Temporary Threshold Shift—TTS is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter, 1985). While experiencing TTS, the hearing threshold rises, and a sound must be stronger in order to be heard. In terrestrial mammals, TTS can last from minutes or hours to days (in cases of strong TTS). For sound exposures at or somewhat above the TTS threshold, hearing sensitivity in both terrestrial and marine mammals 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 published data concern TTS elicited by exposure to multiple pulses of sound. Available data on TTS in marine mammals are summarized in Southall *et al.* (2007).

Given the available data, the received level of a single pulse (with no frequency weighting) might need to be approximately 186 dB re 1 μPa^2-s (i.e., 186 dB sound exposure level [SEL] or approximately 221-226 dB p-p [peak]) in order to produce brief, mild TTS. Exposure to several strong pulses that each have received levels near 190 dB rms (175-180 dB SEL) might result in cumulative exposure of approximately 186 dB SEL and thus slight TTS in a small odontocete, assuming the TTS threshold is (to a first approximation) a function of the total received pulse energy.

The above TTS information for odontocetes is derived from studies on the bottlenose dolphin (*Tursiops truncatus*) and beluga whale (*Delphinapterus leucas*). There is no published TTS information for other species of cetaceans. However, preliminary evidence from a harbor porpoise exposed to pulsed sound suggests that its TTS threshold may have been lower (Lucke *et al.*, 2009). As summarized above, data that are now available imply that TTS is unlikely to occur unless odontocetes are exposed to pile driving pulses stronger than 180 dB re 1 μPa rms.

Permanent Threshold Shift—When PTS occurs, there is physical damage to the sound receptors in the ear. In severe cases, there can be total or partial deafness, while in other cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter, 1985). There is no specific evidence that exposure to pulses of sound can cause PTS in any marine mammal. However, given the possibility that mammals close to a sound source can incur TTS, it is possible that some individuals might incur PTS. Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage, but repeated or (in some cases) single exposures to a level well above that causing TTS onset might elicit PTS.

Relationships between TTS and PTS thresholds have not been studied in marine mammals but are assumed to be similar to those in humans and other terrestrial mammals, based

on anatomical similarities. PTS might occur at a received sound level at least several decibels above that inducing mild TTS if the animal were exposed to strong sound pulses with rapid rise time. Based on data from terrestrial mammals, a precautionary assumption is that the PTS threshold for impulse sounds (such as pile driving pulses as received close to the source) is at least 6 dB higher than the TTS threshold on a peak-pressure basis and probably greater than 6 dB (Southall *et al.,* 2007). On an SEL basis, Southall *et al.* (2007) estimated that received levels would need to exceed the TTS threshold by at least 15 dB for there to be risk of PTS. Thus, for cetaceans, Southall *et al.* (2007) estimate that the PTS threshold might be an M-weighted SEL (for the sequence of received pulses) of approximately 198 dB re 1 μPa^2-s (15 dB higher than the TTS threshold for an impulse). Given the higher level of sound necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur.

Measured source levels from impact pile driving can be as high as 214 dB rms. Although no marine mammals have been shown to experience TTS or PTS as a result of being exposed to pile driving activities, captive bottlenose dolphins and beluga whales exhibited changes in behavior when exposed to strong pulsed sounds (Finneran *et al.,* 2000, 2002, 2005). The animals tolerated high received levels of sound before exhibiting aversive behaviors. Experiments on a beluga whale showed that exposure to a single watergun impulse at a received level of 207 kPa (30 psi) p-p, which is equivalent to 228 dB p-p, resulted in a 7 and 6 dB TTS in the beluga whale at 0.4 and 30 kHz, respectively. Thresholds returned to within 2 dB of the pre-exposure level within four minutes of the exposure (Finneran *et al.,* 2002). Although the source level of pile driving from one hammer strike is expected to be much lower than the single watergun impulse cited here, animals being exposed for a prolonged period to repeated hammer strikes could receive more sound exposure in terms of SEL than from the single watergun impulse (estimated

at 188 dB re 1 μPa^2-s) in the aforementioned experiment (Finneran *et al.*, 2002). However, in order for marine mammals to experience TTS or PTS, the animals have to be close enough to be exposed to high intensity sound levels for a prolonged period of time. Based on the best scientific information available, these SPLs are far below the thresholds that could cause TTS or the onset of PTS.

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 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.

Disturbance Reactions

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. Behavioral responses to sound are highly variable and context-specific and reactions, if any, depend on species, state of maturity,

experience, current activity, reproductive state, auditory sensitivity, time of day, and many other factors (Richardson *et al.,* 1995; Wartzok *et al.,* 2003; Southall *et al.,* 2007).

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. 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. Behavioral state may affect the type of response as well. 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 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 guns or acoustic harassment devices, but also including pile driving) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; Thorson and Reyff, 2006; see also Gordon *et al.,* 2004; Wartzok *et al.,* 2003; Nowacek *et al.,* 2007). 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).

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);
- Habitat abandonment due to loss of desirable acoustic environment; and
- 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, or interfering with, a marine mammal's ability to hear other sounds. Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher levels. Chronic exposure to excessive, though not high-intensity, sound could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions. Masking can interfere with detection of acoustic signals such as

communication calls, echolocation sounds, and environmental sounds important to marine mammals. Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance fitness in survival and reproduction. If the coincident (masking) sound were anthropogenic, it could be potentially harassing if it disrupted hearing-related behavior. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs only 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.

Masking occurs at the frequency band which the animals utilize so the frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Because sound generated from in-water vibratory pile driving is mostly concentrated at low frequency ranges, it may have less effect on high frequency echolocation sounds made by porpoises. However, lower frequency man-made sounds are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey sound. It may also affect communication signals when they occur near the sound band and thus reduce the communication space of animals (e.g., Clark *et al.,* 2009) and cause increased stress levels (e.g., Foote *et al.,* 2004; Holt *et al.,* 2009).

Masking has the potential to impact species at the population or community levels as well as at individual levels. Masking affects both senders and receivers of the signals and can potentially have long-term chronic effects on marine mammal species and populations. Recent research suggests that 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, and that

most of these increases are from distant shipping (Hildebrand, 2009). All anthropogenic sound sources, such as those from vessel traffic, pile driving, and dredging activities, contribute to the elevated ambient sound levels, thus intensifying masking.

Vibratory pile driving is relatively short-term, with rapid oscillations occurring for 10 to 30 minutes per installed pile. 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 pile driving, and which have already been taken into account in the exposure analysis.

Acoustic Effects, Airborne - Marine mammals that occur in the project area could be exposed to airborne sounds associated with pile driving that have the potential to cause harassment, depending on their distance from pile driving activities. Airborne pile driving sound would have less impact on cetaceans than pinnipeds because sound from atmospheric sources does not transmit well underwater (Richardson *et al.*, 1995); thus, airborne sound would only be an issue for pinnipeds either hauled-out or looking with heads above water in the project area. 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 their habitat and move further from the source. Studies by Blackwell *et al.* (2004) and Moulton *et al.* (2005) indicate a tolerance or lack of response to unweighted airborne sounds as high as 112 dB peak and 96 dB rms. However, since there are no

haulout areas in the immediate vicinity of Jetty A, pinnipeds are unlikely to be disturbed by airborne acoustics associated with pile driving activities. Therefore, such impacts to will not be considered as part of the analysis

Vessel Interaction

Besides being susceptible to vessel strikes, cetacean and pinniped responses to vessels may result in behavioral changes, including greater variability in the dive, surfacing, and respiration patterns; changes in vocalizations; and changes in swimming speed or direction (NRC 2003). There will be a temporary and localized increase in vessel traffic during construction. A maximum of three work barges will be present at any time during the in-water and over water work. The barges will be located near each other where construction is occurring

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. 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) sounds. 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. 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. Additionally, NMFS 2011 Biological Opinion indicated that no adverse effects were anticipated for critical habitat of prey species for marine mammals. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the short timeframe for the project.

Effects to Foraging Habitat - Pile installation may temporarily increase turbidity resulting from suspended sediments. Any increases would be temporary, localized, and minimal. The Corps 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 terminal 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.

Natural tidal currents and flow patterns in MCR waters routinely disturb sediments. High volume tidal events can result in hydraulic forces that re-suspend benthic sediments, temporarily

elevating turbidity locally. Any temporary increase in turbidity as a result of the proposed action is not anticipated to measurably exceed levels caused by these normal, natural periods.

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 Corps 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 which are depicted in Table 3 found later in the *Estimated Take by Incidental Harassment* section.

The Corps committed to the use of vibratory hammers for pile installation and will implement a soft-start procedure. In order to avoid exposure of Southern resident killer whales (*Orcinus orca*) the Corps also is limiting the installation window to on or after May 1 and will avoid installation or removal after September 30

Monitoring Protocols – Monitoring would be conducted before, during, and after pile driving and removal activities. In addition, 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. Monitoring will take place from 15 minutes prior to initiation through thirty 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 thirty minutes. Please see Section 13 of the Application for details on the marine mammal monitoring plan developed by the Corps with NMFS' cooperation.

The following additional measures apply to visual monitoring:

(1) Monitoring will be conducted by qualified observers, 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. These vantage points include Jett A or the barge. Qualified observers 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) Advanced education in biological science or related field (undergraduate degree or higher required);

(c) Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience);

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

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

(f) 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; and

(g) 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.

(2) Prior to the start of pile driving activity, the shutdown zone will be monitored for 15 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.). In addition, if such conditions should arise during impact pile driving that is already underway, the activity would be halted.

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 15 minutes have passed without re-detection of the animal. Monitoring will be conducted throughout the time required to drive a pile.

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 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 vibratory pile driving. We require the Corps to initiate sound from vibratory hammers for fifteen seconds at reduced energy followed by a thirty-second waiting period, with the procedure repeated two additional times. Soft start will be required at the beginning of each day's pile driving work and at any time following a cessation of pile driving of 20 minutes or longer.

In addition to the measures described later in this section, the Corps would employ the following standard mitigation measures:

(a) Conduct briefings between construction supervisors and crews, marine mammal monitoring team, and Corps 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.

(b) 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. This type of work could include the following activities: (1) movement of the barge to the pile location or (2) positioning of the pile on the substrate via a crane (i.e., stabbing the pile).

Monitoring and Shutdown for Pile Driving

The following measures would apply to the Corps' mitigation through shutdown and disturbance zones:

Shutdown Zone – For all pile driving activities, the Corps will establish a shutdown zone. Shutdown zones are intended to contain the area in which SPLs equal or exceed the 180/190 dB rms 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. The estimated shutdown zone for Level A injury to cetaceans would be 1 meter. The Corps, however, would implement a minimum shutdown zone of 10 m radius for all marine mammals around all vibratory pile driving and removal activities. These precautionary measures are intended to further reduce the unlikely possibility of injury from direct physical interaction with construction operations.

Disturbance Zone – Disturbance zones are the areas in which sound pressure levels (SPLs) equal or exceed 120 dB rms (for continuous 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. 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; disturbance zone monitoring is discussed in greater detail later (see "Proposed Monitoring and Reporting"). Nominal radial distances for disturbance zones are shown in Table 4 later in this notice. The shutdown zone for Level B injury wound extend 7,356 meters from the sound source. 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. We discuss monitoring objectives and protocols in greater depth in "Proposed Monitoring and Reporting."

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, 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. In order minimize impact to Southern resident killer whales, in-water work will not be conducted during their primary feeding season extending from October 1 until on or after May 1. Installation could occur from May 1 through September 30 each year.

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 mammals

- The proven or likely efficacy of the specific measure to minimize adverse impacts as planned
- 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, 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, 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, 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 incidental take authorizations (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.

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 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.

The Corps submitted a marine mammal monitoring plan as part of the IHA application for this project, which can be found at

w*ww.nmfs.noaa.gov/pr/permits/incidental/construction.htm*. The plan may be modified or supplemented based on comments or new information received from the public during the public comment period.

Visual Marine Mammal Observation

The Corps 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. The Corps will monitor the shutdown zone and disturbance zone before, during, and after pile driving, with at least one located at a best practicable vantage point, such as on the Jetty A or the barge. Based on our requirements, the Marine Mammal Monitoring Plan would implement the following procedures for pile driving:

- Individuals meeting the minimum qualifications identified in the applicant's monitoring plan, Section 13 of the application, Level A and Level B harassment zones during impact during vibratory pile driving.
- The area within the Level B harassment threshold for impact driving (shown in Figure 19 of the application) will be monitored by the field monitor stationed either on Jetty A or a pile driving rig. Any marine mammal documented within the Level B harassment zone during impact driving would constitute a Level B take (harassment), and will be recorded and reported as such.
- During vibratory pile driving, a shutdown zone will be established to include all areas where the underwater SPLs are anticipated to equal or exceed the Level A (injury) criteria for marine mammals (180 dB isopleth for cetaceans; 190 dB isopleth for

pinnipeds). Pile installation will not commence or will be suspended temporarily if any marine mammals are observed within or approaching the area. The shutdown zone will always be a minimum of 10 meters (33 feet) to prevent injury from physical interaction of marine mammals with construction equipment

- The individuals will scan the waters within each monitoring zone activity using binoculars (Vector 10X42 or equivalent), spotting scopes (Swarovski 20-60 zoom or equivalent), and visual observation.
- Use a hand-held or boat-mounted GPS device or rangefinder to verify the required monitoring distance from the project site.
- If waters exceed a sea-state which restricts the observers' ability to make observations within the marine mammal shutdown zone (e.g. excessive wind or fog), pile installation will cease. Pile driving will not be initiated until the entire shutdown zone is visible.
- Conduct pile driving only during daylight hours from sunrise to sunset when it is possible to visually monitor marine mammals.
- The waters will be scanned 15 minutes prior to commencing pile driving at the beginning of each day, and prior to commencing pile driving after any stoppage of 15 minutes or greater. If marine mammals enter or are observed within the designated marine mammal shutdown zone during or 15 minutes prior to pile driving, the monitors will notify the on-site construction manager to not begin until the animal has moved outside the designated radius.
- The waters will continue to be scanned for at least 30 minutes after pile driving has completed each day, and after each stoppage of 20 minutes or greater.

Data Collection

We require that observers use approved data forms. Among other pieces of information, the Corps 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 Corps 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 Corps would provide NMFS with a draft monitoring report within 90 days of the conclusion of the proposed construction work. This report will detail the monitoring protocol, summarize the data recorded during monitoring, and estimate the number of marine mammals that may have been harassed. 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 an injury (Level A harassment), serious injury or mortality (e.g., ship-strike, gear interaction, and/or entanglement), the Corps would immediately cease the specified activities and immediately report the incident to Jolie Harrison (*Jolie.Harrison@NOAA.gov*), Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and Brent Norberg *(Brent.Norberg@noaa.gov*), the West Coast Regional 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 Corps to determine what is necessary to minimize

the likelihood of further prohibited take and ensure MMPA compliance. The Corps would not be able to resume their activities until notified by NMFS via letter, email, or telephone.

In the event that the Corps 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 Corps would immediately report the incident to Jolie Harrison (*Jolie.Harrison@NOAA.gov*), Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and Brent Norberg *(Brent.Norberg@noaa.gov*), the West Coast Regional 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 Corps to determine whether modifications in the activities are appropriate.

In the event that the Corps 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 Corps would report the incident to Jolie Harrison (*Jolie.Harrison@NOAA.gov*), Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, 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 Brent Norberg *(Brent.Norberg@noaa.gov*), the West Coast Regional Stranding Coordinator, within 24 hours of the discovery. The Corps 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, section 3(18) of the MMPA defines "harassment" as: ". . . any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by 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 and may result in temporary changes in behavior. Injurious or lethal takes are not expected due to the expected source levels and sound source characteristics associated with the activity, and the proposed mitigation and monitoring measures are expected to further 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.

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 the vicinity of Jetty A, we believe that incidents of incidental take resulting from airborne sound or visual disturbance are unlikely.

The Corps requested authorization for the incidental taking of small numbers of killer whale, Gray whale, harbor porpoise, Steller sea lion, California sea lion, and harbor seal near the MCR project area that may result from vibratory pile driving and removal during construction activities associated with the rehabilitation of Jetty A at the MCR.

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 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 generic sound exposure thresholds to determine when an activity that produces sound might result in impacts to a marine mammal such that a take by harassment might occur. To date, no studies have been conducted that explicitly examine impacts to marine mammals from pile driving sounds or from which empirical sound thresholds have been established. These thresholds (Table 3) are used to estimate when harassment may occur (i.e., when an animal is exposed to levels equal to or exceeding the relevant criterion) in specific contexts; however, useful contextual information that may inform our assessment of effects is typically lacking and we consider these thresholds as step functions. NMFS is working to revise these acoustic

guidelines; for more information on that process, please visit

www.nmfs.noaa.gov/pr/acoustics/guidelines.htm.

Table 3. Underwater Injury and Disturbance Threshold Decibel Levels for Marine Mammals

Criterion	Criterion Definition	Threshold*
Level A harassment	PTS (injury) conservatively based on TTS**	190 dB RMS for pinnipeds 180 dB RMS for cetaceans
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

** PTS=Permanent Threshold Shift; TTS=Temporary Threshold Shift

Distance to Sound Thresholds

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.

This formula neglects loss due to scattering and absorption, which is assumed to be zero here. The degree to which underwater sound propagates away from a sound source is dependent

on a variety of factors, most notably the water bathymetry and presence or absence of reflective or absorptive conditions including in-water structures and sediments. Spherical spreading occurs in a perfectly unobstructed (free-field) environment not limited by depth or water surface, resulting in a 6 dB reduction in sound level for each doubling of distance from the source (20*log[range]). Cylindrical spreading occurs in an environment in which sound propagation is bounded by the water surface and sea bottom, resulting in a reduction of 3 dB in sound level for each doubling of distance from the source (10*log[range]). A practical spreading value of fifteen is often used under conditions where water increases with depth as the receiver moves away from the shoreline, resulting in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions. Practical spreading loss (4.5 dB reduction in sound level for each doubling of distance) is assumed here.

The Corps does not have information or modeling results related to pile installation activities. However, some features of the proposed action are similar to those recently proposed by the Navy, WSDOT, and other entities which were issued IHA/LOAs. For these reasons, NMFS considered some of the results from previous, representative monitoring efforts. Though the MCR navigation channel is a major commercial thoroughfare, there are no ports or piers in the immediate proximity of the jetties, as the seas are too dangerous. The location and setting of the MCR jetties is far more dynamic than a naval pier setting in the Puget Sound, the substrate is mostly sand, and the natural background noise is likely to be much higher with the large, breaking wave sets, dynamic currents, and high winds. The Corps project is also in the immediate proximity of the open ocean, with less opportunity for sound attenuation by land.

NMFS considered representative results from underwater monitoring for concrete, steel, and wood piles that were installed via both impact and vibratory hammers in water depths from 5

to 15 meters (Illingworth and Rodkin 2007, WSDOT 2011 cited in Naval Base Kitsap 2014, Navy 2014, and NMFS 2011b). Transmission loss and propagation estimates are affected by the size and depth of the piles, the type of hammer and installation method, frequency, temperature, sea conditions, currents, source and receiver depth, water depth, water chemistry, and bottom composition and topography. NMFS reviewed several documents that included relevant monitoring results for radial distances and proxy sound levels encompassed by underwater pile driving noise. These distances for impact driving and vibratory driving for 24-in steel piles were summarized previously in Table 15 and Table 16 in the Application.

Since no site-specific, in-water noise attenuation data is available, the practical spreading model described and used by NMFS was used to determine transmission loss and the distances at which impact and vibratory pile driving or removal source levels are expected to attenuate down to the pertinent acoustic thresholds. The underwater practical spreading model is provided below:

$$R_2 = R_1 * 10^{\wedge} ((dB_{at\ R1} - dB_{acoustic\ threshold})/15)$$

where:

R_1 = distance of a known or measured sound level.

R_2 = estimated distance required for sound to attenuate to a prescribed acoustic threshold.

NMFS used representative sound levels from different studies to determine appropriate proxy sound levels and to model estimated distances until pertinent thresholds (R_1 and dB at R_1). Studies which met the following parameters were considered: pile materials comprised of wood,

concrete, and steel pipe piles; pile sizes 24- up to 30-inches diameter, and pile driver type of either vibratory and impact hammers. These types and sizes of piles were considered in order to evaluate a representative range of sound levels that may result from the Proposed Action. In some cases since there was little or no data specific to 24-inch piles, NMFS analyzed 30-inch piles as the next larger pile size with available data. The Corps will include a maximum pile size of 24-inches as a constraint in its construction contracts, though it will consult with NMFS regarding the originally proposed size.

Results of the practical spreading model provided the distance of the radii that were used to establish a ZOI or area affected by the noise criteria. At the MCR, the channel is about 3 miles across between the South and North Jetty. These jetties, as well as Jetty A, could attenuate noise, but the flanking sides on two of the jetties are open ocean, and Jetty A is slightly further interior in the estuary. Clatsop Spit, Cape Disappointment, Hammond Point, as well as the Sand Islands, are also land features that would attenuate noise. Therefore, as a conservative estimate, the NMFS is using (and showing on ZOI maps) the maximum distance and area but has indicated jetty attenuation in the ZOI area maps (See Figure 19 in the Application).

NMFS selected proxy values for impact installation methods and calculated distances to acoustic thresholds for comparison and contextual purposes. As note previously, the Corps is not proposing impact installation. NMFS ultimately relied most heavily on the proxy values developed by the Navy (2014).

For impact installation, NMFS used ***193 rms dB re 1 µPa rms*** at a distance of 10 meters, which is comprised of the range of average rms of n-weighted piles used to determine the recommended proxy source SPLs at 10m as determined by Navy (2014). The Tongue Point data (182 db re 1 µPa rms at a distance of 10 meters for 24-in steel piles (Navy 2014) is likely

applicable to this MCR jetty project because it is of similar sandy rather than gravely substrate; and it is within the same geographical and hydraulic context, though it is likely more sheltered than conditions at the jetties. Therefore, 193 rms dB re 1 µPa rms is an extremely conservative proxy estimate for impact installation, as sandy substrate and the hydraulic context at the MCR project area would further reduce spreading distance. Note that impact driving is not being proposed by the Corps.

For vibratory installation, NMFS proposes ***163 dB re 1 µPa rms***. The proxy value of 163 dB re 1 µPa rms is greater than the 24-inch pipe pile proxy and equal to the sheet pile values proposed by Navy (2014) at 161 dB re 1 µPa rms and 163 dB re 1 µPa rms, respectively, and is also higher than the Friday Harbor Ferry sample (162 dB re 1 µPa rms) (Navy 2014 and Laughlin 2010a cited in Washington State Ferries 2013, respectively). NMFS also proposes 163 dB re 1 µPa rms to reflect sheet pile installation, which registered higher than the pipe pile levels in the proxy study. Given the comparative differences between the substrate and context used in the Navy study relative to the MCR, 163 dB re 1 µPa rms is a very conservative evaluation level. Results are listed in Table 4.

Table 4. Calculated Area Encompassed within Zone of Influence at MCR Jetties for Underwater Marine Mammal Sound Thresholds at Jetty A

Jetty	Underwater Threshold	Distance – m (ft)	Area Excluding Land & Jetty Masses - km^2 (mi^2)
Jetty A: ~ Station 78+50, River Side	Impact driving, pinniped injury (190 dB)*	16 (52.5)	<0.001 (0.0003)
	Impact driving, cetacean injury (180 dB)*	74 (242.8)	0.01 (0.004)
	Impact driving, disturbance (160 dB)*	1,585 (5,200.1, or ~1 mile)	3.38 (1.31)
	Vibratory driving, pinniped injury (190 dB)	0	0
	Vibratory driving, cetacean injury (180 dB)	1 (3.3)	<0.000003 (0.000001)

	Vibratory driving, disturbance (120 dB)	7,356 (4.6 miles)	23.63 (9.12)

Note that the actual area insonified by pile driving activities is significantly constrained by local topography relative to the total threshold radius. The actual insonified area was determined using a straight line-of-sight projection from the anticipated pile driving locations. This area is depicted in Table 4 and represented in the Application submitted by the Corps in Figure 19 of the 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, the Biological Opinion, best professional judgment from state and federal agencies, and data from IHA estimates on similar projects with similar actions. All estimates are conservative and include the following assumptions:

- During construction, each species could be present in the project area each day. The potential for a take is based on a 24-hour period. The model assumes that there can be one potential take (Level B harassment exposure) per individual per 24-hours.
- 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 furthest from shore) installed with the method that has the largest ZOI. The largest underwater disturbance ZOI would be produced by vibratory driving steel piles. The ZOIs for each threshold are not spherical and are truncated by land masses which would dissipate sound pressure waves.
- Exposures were based on estimated work days. Numbers of days were based on an average production rate of 15 pilings per day for a total of 68 pile installation days. This means construction at each jetty offloading facility would occur over an approximate span of ~ 17 days.

- In absence of site specific underwater acoustic propagation modeling, the practical spreading loss model was used to determine the ZOI.

Killer Whale

Southern resident killer whales have been observed offshore near the study area and ZOI, but the Corps does not have fine-scale details on frequency of use. However, as noted in Section 3, members of K and L pods were sighted off the Oregon Coast in 1999 and 2000 and whales move as far north as Canada down to California, passing the MCR. While killer whales do occur in the Columbia River plume, where fresh water from the river intermixes with salt water from the ocean, they are rarely seen in the interior of the Columbia River Jetty system. The insonified area associated with the proposed action at Jetty A does not extend out into the open ocean where killer whales are likely to be found. Furthermore, the Corps has limited its pile installation window in order to avoid peak salmon runs and any overlap with the presence of Southern residents. To ensure no Level B acoustical harassment occurs, the Corps will restrict pile installation from October 1 until on or after May 1 of each season. However, this restriction was enacted primarily for construction work at the North and South jetties, where the insonified zone will radiate out towards the open ocean. As such NMFS is not anticipating any acoustic exposure to Southern residents. Also note that in the 2011 Biological Opinion, NMFS issued a not likely to adversely affect determination. Therefore, NMFS has determined that authorization of take for Southern residents is not warranted.

Western Transient killer whales may be traversing offshore over a greater duration of time than the feeding resident. They are rarely observed inside of the jetty system.
The Southwest Fisheries Science Center (SWFSC) stratum model under the Marine Animal Monitor Model provides an estimated density of 0.00070853 animals per km^2 for summer killer

whales for areas near MCR, which may provide a surrogate proxy value for assuming possible densities near the jetties (Barlow *et al.* 2009, Halpin *et al.* 2009 at OBIS-SEAMAP). Given anecdotal evidence (Griffith 2015) and sightings recorded on the OBIS network from surveys done in 2005 (Halpin *et al.* 2009, OBIS-SEAMAP 2015), this density may be appropriate for the MCR vicinity.

The following formula was used to calculate exposure using

Exposure Estimate = $(0.000708_{\text{DensityEstimate}} * 23.63_{\text{ZOI Jetty A}} * 17_{\text{days}}) = 0.28$ killer whale exposures

Where:

$N_{\text{DensityEstimate}}$ = Represents estimated density of species within the 4.6-mile radius encompassing the ZOI at Jetty A; using the density model suggested by NOAA (2015), this equates to 0.000708 animals per km^2 (Barlow *et al.* 2009).

Days = Total days of pile installation or removal activity (~17 days)

Given the low density and rare occurrence of transient killer whales in the ZOI, exposure of feeding or transient killer whales to Level B acoustical harassment from pile driving is unlikely to occur. However, NMFS proposes to authorize take of small number due to the remote chance that transient orcas remain in the vicinity to feed on pinnipeds that frequent the haulouts at the South Jetty.

NMFS proposes to authorize the take of 8 transients because solitary killer whales are rarely observed, and transient whales travel in pods of 2-15 members. NMFS has assumed a pod size of 8.

Gray Whale

Based on anecdotal information and sightings between 2006 and 2011 (Halpin *et al*. 2009 at OBIS SEAMAP 2015), gray whales may be in the proximity of the proposed action area and exposed to underwater acoustic disturbances. However, no data exists that is specific to presence and numbers in the MCR vicinity and gray whale density estimates were not available on the SERDP or OBIS-SEAMAP web model sites. Anecdotal evidence also indicates gray whales have been seen at MCR, but are not a common visitor, as they mostly remain in the vicinity of the further offshore shelf-break (Griffith 2015). According to NOAA's Cetacean Mapping classification of the MCR vicinity pertaining to gray whale use, its Biologically Important Area categorization is indicated as a migration corridor (*http://cetsound.noaa.gov/biologically-important-area-map).* As primarily bottom feeders, gray whales are the most coastal of all great whales; they primarily feed in shallow continental shelf waters and live much of their lives within a few tens of kilometers of shore (Barlow et. al. 2009 on OBIS-SEAMAP 2015).

A relatively small number of whales (approximately 200) summer and feed along the Pacific coast between Kodiak Island, Alaska and northern California (Darling 1984, Gosho *et al.* 2011, Calambokidis *et al*. 2012 cited in NOAA 2014c).

The Pacific Coast Feeding Group or northbound summer migrants would be the most likely gray whales to be in the vicinity of MCR. Since no information pertaining to gray whale densities could be identified, NMFS elected to apply proxy data for estimating densities. As a proxy, data pertinent to humpback whales (0.0039 animals per km^2) was selected because both are baleen species found near the MCR vicinity for the same purposes (as a migration route or temporary feeding zone). However, the number of estimated exposures at Jetty A was increased to account for the fact that gray whales are more likely to be in the nearshore environment than humpback whales. This increase was proposed strictly as a conservative assumption to

acknowledge the distinct preference gray whales may have over humpbacks for nearshore feeding.

The following formula was used to calculate exposure:

Exposure Estimate = $(0.0039_{\text{DensityEstimate}} * 23.63_{\text{ZOI Jetty A}} * 17_{\text{days}}) + 1 = 1.56$ gray whale exposures

Migrating gray whales often travel in groups of 2, although larger pods do occur. For gray whales, NMFS is proposing 4 Level B authorized takes.

Harbor Porpoise

Harbor porpoises are known to occupy shallow, coastal waters and, therefore, are likely to be found in the vicinity of the MCR. They are known to occur within the proposed project area, however, density data for this region is unavailable (Griffith 2015).

The SWFSC stratum model under the Marine Animal Monitor Model provides an estimated density per km^2 of year-round porpoises for areas near northern California, which may provide a surrogate proxy value for assuming possible densities near the jetties. Though not in the project vicinity, the range of 3.642 animals/km^2 (Barlow *et al.* 2009, Halpin *et al*. 2009) is a relatively high density compared to values moving even further south along the model boundaries, for which the northern-most extent ends in California. Given anecdotal evidence (Griffith 2015) and sightings recorded on the OBIS network from surveys done between 1989 and 2005, (Halpin *et al.* 2009, OBIS-SEAMAP 2015), this higher density may be appropriate for the MCR vicinity, or may be conservative.

The formula previously described was used to arrive at a take estimate for harbor porpoise.

Exposure Estimate = $(3.642_{\text{DensityEstimate}} * 23.63_{\text{ZOI Jetty A}} * 17_{\text{days}}) = 1{,}464.$

Based on the density model suggested by NOAA (2015), the Corps has provided a very conservative maximum estimate of 1,4640 harbor porpoise disturbance exposures over the 17 days of operation. However, this number of potential exposures does not accurately reflect the actual number of animals that would potentially be taken for the MCR jetty project. Rather, it is more likely that the same pod may be exposed more than once during the 17-day operating window. The highest estimated number of animals exposed on any single day based on the modeled proxy density (Barlow *et al.* 2009 at SERDP) and the jetty with the greatest ZOI is 193 animals (from South Jetty Channel). While the number of pods in the vicinity of the MCR is unknown, the size of the pods is usually assumed to be significantly smaller than 193 animals. According to OBIS-SEAMAP (2015 and Halpin *et al.* 2009), the normal range of group size generally consists of less than five or six individuals, though aggregations into large, loose groups of 50 to several hundred animals could occur for feeding or migration. Because the ZOI only extends for a maximum of 4.6 miles, it may also be assumed that due to competition and territorial circumstances only a limited number of pods would be feeding in the ZOI at any particular time. If the modeled density calculations are assumed, then this means anywhere from 32 small pods to 2 large, 100-animal pods might be feeding during every day of pile installation. Given these values seem an unrealistic representation of use and pod densities within any one of the ZOIs, NMFS is proposing an alternative calculation.

NMFS conservatively assumed that a single, large feeding pod of 50 animals forms within the ZOI for Jetty A on each day of pile installation. Though this is likely much higher than actual use by multiple pods in the vicinity, it more realistically represents a worst-case scenario for the number of animals that could potentially be affected by the proposed work. This calculation also assumes that it is a new pod of individuals would be affected on each installation

day, which is also unlikely given pod residency. NMFS is proposing this higher number in acknowledgement of the SERDP density estimates originally proposed by NOAA (2015). Therefore, Corps has provided an extreme estimate of disturbance exposures over the duration of the entire project, and is requesting Level B take for 850 animals.

Pinnipeds - Stellar Sea Lion, California Sea Lion and Harbor Seal

There are haulout sites on the South Jetty used by pinnipeds, especially Steller sea lions. It is likely that pinnipeds that use the haulout area in would be exposed to 120 dB threshold acoustic threshold during pile driving activities. The number of exposures would vary based on weather conditions, season, and daily fluctuations in abundance. Based on a survey by the Washington Department of Fish & Wildlife (WDFW) the number of affected Steller sea lions could be between 200-800 animals per month; California sea lion numbers could range from 1 to 500 per month and the number of harbor seals could be as low as 1 to as high as 57 per month Exposure and take estimates below are based on past pinniped data from WDFW (2000-2014 data), which had a more robust monthly sampling frequency relative to ODFW counts. The exception to this was for harbor seal counts, for which ODFW (also 2000-2014 data) had more sampling data in certain months. Therefore, ODFW harbor seal data was used for the months of May and July. Exposure estimates are much higher than take estimates. This is because unlike the exposure estimate which assumes all new individuals, the take estimate request assumes that some of the same individuals will remain in the area and be exposed multiple times during the short 17-day installation period to complete and remove each offloading facility (for a total of about 68 days). NMFS examined the estimated monthly average number of animals from 2000-2014 hauled on South Jetty during May and June, which are the most likely months for pile installation as is shown in Table 5. NMFS assumed that 50% of the three species may be in the

water at any given time during pile installation. This is based on the best professional judgment of a ODFW biologist, who stated: "Assuming another 50% in the water above what is hauled out is probably on the high end, but it's probably best to be conservative (i.e., have more takes authorized than actually incurred). It's probably more like 10-20% but it's highly variable and dependent on a lot of unpredictable factors like weather conditions, recent disturbance events, etc." (ODFW 2015). There are no anticipated airborne exposures since the main haul out sites are not in close proximity to Jetty A. Note that the formula used by NMFS is different than that employed by the Corps in their application as NMFS is only analyzing potential impacts associated with Jetty A.

To reiterate, these exposure estimates assume a new individual is exposed every day throughout each acoustic disturbance, for the entire duration of the project.

Exposure Estimate$_{Stellar}$ = ($N_{est(May+June)}$ * 50% * $17_{underwater/piles\ days}$) = 12,750 Steller sea lions

Exposure Estimate$_{California}$ = ($N_{est(May+June)}$ * 50% * $17_{underwater/piles\ days}$) = 2,788 CA sea lions

Exposure Estimate$_{Harbor}$ = ($N_{est(May+June)}$ * 50% * $17_{underwater/piles\ days}$)= 493 Harbor porpoises

where:

N_{est} = Estimated monthly average number of species hauled out at South Jetty based on WDFW data.

Duration = total days of pile installation or removal activity for underwater thresholds (68);

Density = the estimated percentage of individuals in the respective ZOI: underwater assumed to be 50% of WDFW haul-out average during 2 most likely months of pile installation (May or June);

Table 5. Estimated Sound Exposures Events Experienced by Pinnipeds During Pile Installation at All MCR Jetties and Construction/Survey Seasons at the South Jetty

Month	Steller Sea Lion		California Sea Lion		Harbor Seal	
	Avg[1] #	Underwater (# at 50% Density)	Avg[1] #	Underwater (# at 50% Density)	Avg[1,2] #	Underwater (# at 50% Density)
April	587	-	99	-	-	-
May	824	412	125	63	0	0
June	676	338	202	101	57	29
July	358	-	1	-	10	-

August	324	-	115	-	1	-
September	209	-	249	-	-	-
October	384	-	508	-	-	-
Preliminary Number of Individuals [3]	--	750	--	164	--	29
Total Exposures (over Duration[4]: 17 days		12,750		2,788	--	493

[1] WDFW monthly average from 2000-2014.
[2] ODFW monthly averages for May and July 2000-2014 data due to additional available sampling data.
[3] Conservatively assumes each exposure is to new individual, all individuals are new arrivals each month, and no individual is exposed more than one time.
[3] Assumed 17 pile installation/removal days.

Note that NMFS is using data from the South Jetty since data exists for this pinniped population data exists for haulouts near this location. This represents a worst-case scenario since Jetty A is likely to have fewer pinniped exposures. Therefore, South Jetty will serve as a proxy for Jetty A as part of this analysis.

However, requesting take based on exposure calculations using the above density/duration would inaccurately suggest that the proposed action would take a disproportionally large number of pinnipeds on the West Coast. It also assumes that each exposure is affecting a new animal, when the reality is a single animal is likely to be exposed to underwater disturbance more than one time.

NMFS is proposing the following take estimate and assumptions which should provide more realistic take estimates. NMFS will assume pile installation occurs only in *either* May *or* June, which is the most likely construction scenario. Further, it is assumed that the number of animals taken by underwater acoustic disturbance is represented by the highest average number of animals present during the installation month (May or June), and that all animals are exposed to the underwater disturbance. Therefore, for Steller sea lions, 824 animals will represent the seasonal take; for California sea lions, seasonal take will be 202 animals; and for harbor seals seasonal take will be 57 animals. NMFS will assume one installation season of 17 days and that

in-water work on Jetty A take would take only a single season. It is also assumed that every animal observed during a season would count as a take. Using these assumptions, the take calculations are estimated in Table 6 and result in 824 Stellar sea lion, 202 California sea lion and 57 harbor seal takes.

Table 6. Estimated Sound Exposures Events Experienced by Pinnipeds during Pile Installation at the South Jetty during and Construction/Survey Seasons

Month	Steller Sea Lion		California Sea Lion		Harbor Seal	
	Avg[1] #	**Underwater[3] (# at 100% exposure)**	**Avg[1] #**	**Underwater (# at 100% exposure)**	**Avg[1,2] #**	**Underwater (# at 100% exposure)**
April	587	-	99	-	-	-
May	824	**824**	125	125	0	0
June	676	676	202	**202**	57	**57**
July	358	-	1	-	10	-
August	324	-	115	-	1	-
September	209	-	249	-	-	-
October	384	-	508	-	-	-
Preliminary Number of Individuals per season (~17 days)[4]	--	**824**	--	**202**	--	**57**

[1] WDFW monthly average for daily populations counts from 2000-2014.
[2] ODFW monthly averages for May and July 2000-2014 data) for daily population count due to additional available sampling data.
[3] Conservatively assumes each exposure is to new individual, all individuals are new arrivals each month, and no individual is exposed more than one time.
[4] Assumed 17 pile installation/removal days.

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 Level B harassment 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" through behavioral harassment, 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 driving activities associated with the rehabilitation of Jetty A at the mouth of the Columbia River, 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) only, from underwater sounds generated from pile driving. Potential takes could occur if individuals of these species are present in the insonified zone when pile driving is happening.

No injury, serious injury, or mortality is anticipated given the nature of the activity and measures designed to minimize the possibility of injury to marine mammals. The potential for these outcomes is minimized through the construction method and the implementation of the planned mitigation measures. Specifically, vibratory hammers will be the only method of installation utilized. No impact driving is planned. Vibratory driving does not have significant potential to cause injury to marine mammals due to the relatively low source levels produced

(site-specific acoustic monitoring data show no source level measurements above 180 dB rms) and the lack of potentially injurious source characteristics. The likelihood that marine mammal detection ability by trained observers is high under the environmental conditions described for the rehabilitation of Jetty A at MCR further enables the implementation of shutdowns to avoid injury, serious injury, or mortality.

The Corps' proposed activities are localized and of short duration. The entire project area is limited to the Jetty A area and its immediate surroundings. Actions covered under the Authorization would include installing a maximum of 24 piles for use as dolphins and a maximum of 93 sections of Z or H piles for retention of rock fill over 17 days. The piles would be a maximum diameter of 24 inches and would only be installed by vibratory driving method. The possibility exists that smaller diameter piles may be used but for this analysis it is assumed that 24 inch piles will be driven.

These localized and short-term noise exposures may cause brief startle reactions or short-term behavioral modification by the animals. These reactions and behavioral changes are expected to subside quickly when the exposures cease. Moreover, the proposed mitigation and monitoring measures are expected to reduce potential exposures and behavioral modifications even further. Additionally, no important feeding and/or reproductive areas for marine mammals are known to be near the proposed action area. Therefore, the take resulting from the proposed project is not reasonably expected to and is not reasonably likely to adversely affect the marine mammal species or stocks through effects on annual rates of recruitment or survival.

The project also is not expected to have significant adverse effects on affected marine mammals' habitat, as analyzed in detail in the "Anticipated Effects on Marine Mammal Habitat" section. 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.

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 driving activities analyzed here are similar to, or less impactful than, numerous construction activities conducted in other similar locations, 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. Level B harassment will be reduced to the level of least practicable impact through use of mitigation measures described herein and, if sound produced

by project activities is sufficiently disturbing, animals are likely to simply avoid the project area while the activity is occurring.

In summary, this negligible impact analysis is founded on the following factors: (1) the possibility of 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 and; (3) 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 Corps' rehabilitation of Jetty A at MCR will have a negligible impact on the affected marine mammal species or stocks.

Small Numbers Analysis

Table 7 demonstrates the number of animals that could be exposed to received noise levels that could cause Level B behavioral harassment for the proposed work associated with the rehabilitation of Jetty A at MCR. The analyses provided above represents between <0.01% - 3.9% of the populations of these stocks that could be affected by Level B behavioral harassment. 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 occurring in the vicinity of Jetty A, 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 of Marine Mammals That May Be Exposed to Level B Harassment

Species	Total proposed authorized takes	Abundance	Percentage of total stock
Killer whale (Western transient stock)	8	243	3.2%
Gray whale (Eastern North Pacific Stock)	4	18,017	<0.01%
Harbor porpoise	850	21,487	3.9%
Steller sea lion	824	63,160-78,198	1.3-1.0%
California sea lion	202	296,750	0.01%
Harbor seal	57	24,732	0.2%

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 mitigation and monitoring measures, which are expected to reduce the number of marine mammals potentially affected by the proposed action, 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

There are no relevant subsistence uses of marine mammals implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

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: humpback whale and Southern resident killer whale. For the purposes of this IHA, NMFS determined that take of Southern resident killer whales was highly unlikely given the rare occurrence of these animals in the project area. A similar conclusion was reached for humpback whales. On March 18, 2011, NMFS signed a Biological Opinion concluding that the proposed action is not likely to jeopardize the continued existence of humpback whales and may affect, but is not likely to adversely affect Southern resident killer whales.

National Environmental Policy Act (NEPA)

The Corps issued the *Final Environmental Assessment Columbia River at the Mouth, Oregon and Washington Rehabilitation of the Jetty System at the Mouth of the Columbia River* and *Finding of No Significant Impact* in 2011. The environmental assessment (EA) and finding of no significant interest (FONSI) were revised in 2012 with a FONSI being signed on July 26, 2012. NMFS will seek to re-affirm the findings of the 2012 FONSI.

Proposed Incidental Harassment Authorization

As a result of these preliminary determinations, we propose to issue an IHA to the USACE the rehabilitation of Jetty A of the Columbia River Jetty System 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 May 1, 2016 through April 30, 2017.

2. This Authorization is valid only for in-water construction work associated with the rehabilitation of Jetty A at MCR.

3. General Conditions

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

   (b) The species authorized for taking include killer whale (*Orcinus orca*), Steller sea lion (*Eumatopius jubatus*), gray whale (*Eschrichtius robustus*), harbor porpoise (*Phocoena phocoena*), California sea lion (*Zalophus californianus)*, 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) of the Authorization 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 Corps 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, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

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 Corps shall operate only during daylight hours when visual monitoring of marine mammals can be conducted.

(b) Establishment of Level B Harassment (ZOI)

(i) Before the commencement of in-water pile driving activities, The Corps shall establish Level B behavioral harassment ZOI where received underwater sound pressure levels (SPLs) are higher then 120 dB (rms) re 1 µPa for and non-pulse sources (vibratory hammer). The ZOI delineates where Level B harassment would occur. For vibratory driving, the level B harassment area is between 10 m and 7.3 km.

(c) The Corps is authorized to utilize only vibratory driving under this IHA.

(d) Establishment of shutdown zone

(i) Implement a minimum shutdown zone of 10 m during vibratory driving activities. If a marine mammal comes within or approaches the shutdown zone, such operations shall cease.

(e) Use of Soft-start

(i) The project will utilize soft start techniques for vibratory pile driving. We require the Corps to initiate sound from vibratory hammers for fifteen seconds at reduced energy followed by a thirty-second waiting period, with the procedure repeated two additional times. Soft start will be required at the beginning of each day's pile driving work and at any time following a cessation of pile driving of thirty minutes or longer.

(ii) Whenever there has been downtime of 20 minutes or more without vibratory driving, the contractor will initiate the driving with soft-start procedures described above.

(f) Standard mitigation measures

(i) Conduct briefings between construction supervisors and crews, marine mammal monitoring team, and Corps 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.

(ii) 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. This type of work could include the following activities: (1) movement of the barge to the pile location or (2) positioning of the pile on the substrate via a crane (i.e., stabbing the pile).

(g) The Corps 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 identified in Section 13 of the application by the Corps will monitor the exclusion and Level B harassment zones during vibratory pile driving.

(ii) During pile driving, the area within 10 meters of pile driving activity will be monitored and maintained as marine mammal buffer area in which pile installation will not commence or will be suspended temporarily if any marine mammals are observed within or approaching the area of potential disturbance. This area will be monitored by one qualified field monitor stationed either on the jetty pile or pile driving rig.

(iii) The area within the Level B harassment threshold for pile driving will be monitored by one observer stationed to provide adequate view of the harassment zone, such as Jetty A or the barge. 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 during impact driving 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 (Vector 10X42 or equivalent), spotting scopes (Swarovski 20-60 zoom or equivalent), and visual observation .

(v) If waters exceed a sea-state which restricts the observers' ability to make observations within the marine mammal buffer zone (the 100 meter radius) (e.g. excessive wind or fog), impact pile installation will cease until conditions allow the resumption of monitoring.

(vi) The waters will be scanned 15 minutes prior to commencing pile driving at the beginning of each day, and prior to commencing pile driving after any stoppage of 20 minutes or greater. If marine mammals enter or are observed within the designated marine mammal buffer zone (the 10m radius) during or 15 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, and after each stoppage of 20 minutes or greater.

(b) Data Collection

(i) Observers are required to use approved data forms. Among other pieces of information, the Corps 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 Corps 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:

1. Date and time that monitored activity begins or ends;
2. Construction activities occurring during each observation period;
3. Weather parameters (e.g., percent cover, visibility);
4. Water conditions (e.g., sea state, tide state);
5. Species, numbers, and, if possible, sex and age class of marine mammals;
6. Description of any observable marine mammal behavior patterns, including bearing and direction of travel and distance from pile driving activity;
7. Distance from pile driving activities to marine mammals and distance from the marine mammals to the observation point;
8. Locations of all marine mammal observations; and
9. 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 Corps 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 West Coast Regional Stranding Coordinators. The report would include the following information:

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

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

(iii) In the event that the Corps 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 Corps would immediately 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 West Coast 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 Corps to determine whether modifications in the activities are appropriate.

(iv) In the event that the Corps 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 Corps 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 West Coast Regional Stranding Coordinators, within 24 hours of the discovery. The Corps 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.

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 Corps' rehabilitation of Jetty A at MCR. Please include with your comments any supporting data or literature citations to help inform our final decision on the Corps' request for an MMPA authorization.

Dated: July 17, 2015.

_____

Perry Gayaldo,
Deputy Director,
Office of Protected Resources,
National Marine Fisheries Service

[FR Doc. 2015-18022 Filed: 7/22/2015 08:45 am; Publication Date: 7/23/2015]