This document is scheduled to be published in the
Federal Register on 10/17/2018 and available online at
https://federalregister.gov/d/2018-22604, and on **govinfo.gov**

BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XG506

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to In-Water Demolition and Construction Activities Associated with a Harbor Improvement Project in Statter Harbor, Alaska

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

ACTION: Notice; proposed incidental harassment authorization; request for comments on proposed authorization and possible renewal.

SUMMARY: NMFS has received a request from the City of Juneau for authorization to take marine mammals incidental to harbor improvement projects in Statter Harbor, Alaska. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-year renewal that could be issued under certain circumstances and if all requirements are met, as described in *Request for Public Comments* at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***].

ADDRESSES: Comments should be addressed to 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.Young@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 online at *https://www.fisheries.noaa.gov/node/23111* 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: Sara Young, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

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

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other means of effecting the least practicable adverse impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stocks for taking for certain subsistence uses (referred to in shorthand as “mitigation”); and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth.

The NDAA (Pub. L. 108–136) removed the “small numbers” and “specified geographical region” limitations indicated above and amended the definition of “harassment” as it applies to a “military readiness activity.” The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

National Environmental Policy Act

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

This action is consistent with categories of activities identified in Categorical Exclusion B4 (IHAs with no anticipated serious injury or mortality) of the Companion Manual for NOAA

Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has preliminarily determined that the issuance of the proposed IHA qualifies to be categorically excluded from further NEPA review.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA request.

Summary of Request

On February 12, 2018, NMFS received a request from the City of Juneau for an IHA to take marine mammals incidental to harbor improvement projects in Statter Harbor, Alaska. The original application covered three years of potential work and was revised to one year of work on March 9, 2018. A series of exchanges regarding acoustic analyses continued until a meeting was held on June 21, 2018. An additional revision was received on August 8, 2019. The application was deemed adequate and complete on September 18, 2018. The City of Juneau's request is for take of a small number of harbor seal, harbor porpoise, humpback whale, and Steller sea lion by Level B harassment and Level A harassment. Neither the City of Juneau nor NMFS expects serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

Description of Proposed Activity

Overview

The harbor improvements described in the application include demolition and disposal of the existing boat launch ramp and timber haulout pier, dredging of the planned harbor basin with offshore disposal, excavation of bedrock within the basin by blasting from a temporary fill pad, and construction of a mechanically stabilized earth (MSE) wall.

Dates and Duration

Work is expected to occur between January 1, 2019 and December 31, 2019. The expected allocation of days for each activity is as follows: two to ten days of vibratory pile removal, 30-45 days of dredging and dredge disposal, 15 days of in-water fill placement and removal, and two days of blasting. In winter months, shorter 8-hour to 10- hour workdays in available daylight are anticipated. To be conservative, 12-hour work days were used to analyze construction noise. The daily construction window for blasting and dredging will begin no sooner than 30 minutes after sunrise to allow for initial marine mammal monitoring to take place and will end 30 minutes before sunset to allow for post-activity monitoring.

Specific Geographic Region

The proposed activities would occur at Statter Harbor in Auke Bay, Alaska which is in the southeast portion of the state. See Figures 1 and 4 in the application for detailed maps of the project area. Statter Harbor is located at the most northeasterly point of Auke Bay.

Detailed Description of Specific Activity

Demolition and Disposal – Work proposed for 2019 includes demolition and disposal of the existing 16-foot (ft) (4.9-meter (m)) by 200-ft (61-meter) concrete boat launch ramp and planks, an 8-ft (2.4-m) by 240-ft (73.2-m) boarding float, four 12.75-inch (in) (3.2-decimeter) diameter steel pipe piles, 1,152 square feet (ft) (107.0 square m) of timber boat haulout pier, and 16 12-in to 16-in creosote-treated timber piles.

Demolition of the existing timber boat haulout pier and boat launch ramp will be performed with track excavators, loaders, cranes, barges, crane dead-pulling (preferred method), vibratory hammer (if needed), various hand tools, and labor forces. Existing piles will be removed via dead-pulling with a crane if possible, or, if not, a vibratory hammer will be used.

Vibratory pile removal will generally consist of clamping the vibratory hammer to the pile and vibrating the hammer while extracting to a point where the pile is temporarily secured and removal can be completed with crane line rigging under tension. The pile is then completely removed from the water by hoisting with crane line rigging and placing on the uplands or deck of the barge. The applicant will dispose of demolished items in accordance with all Federal, state, and local regulations.

Based on the characterization of work described below, we expect take of marine mammals may result from some combination of vibratory pile removal, dredging, and blasting activities.

Dredging and Dredge Disposal

The project includes 24,300 cubic yards (yd^3)(18,578.7 cubic meters (m^3)) of dredging in the existing harbor. When the material is removed from the ground it will bulk up in the barge due to increased water content and fluff. To account for this a conservative bulking factor of 1.25 was applied to the dredged volume, resulting in up to 30,375 yd^3(23,223.4m^3) of material to be disposed. Dredging will be performed by either an excavator or a crane with clamshell from a flat deck or derrick barge. The barge will be fixed in place to allow the excavator access to an area and periodically repositioned to gain access to new areas.

Once material is removed from the seafloor, it will be placed into a second belly dump dredge barge where the material will be dewatered and then be towed by a tug to the disposal site to be deposited. The target location for disposal of material was provided to the applicant by the Alaska Department of Fish and Game (ADF&G) just outside of the harbor at latitude 58° 22' 22.08" N and 134° 39'49.32" W. Based on the nature of dredge disposal activity, substrate placed on a small barge and towed to a disposal site, we do not consider dredge disposal an activity that could result in take of marine mammals and do not consider it further. Because the dredging activity is producing sound underwater at levels likely audible to marine mammals and the sound source is concentrated underwater in a region with resident marine mammals it has the potential harass marine mammals and was considered further in our analysis.

Blasting and Excavation

A geotechnical investigation including borehole samples and test probing was performed by PND Engineers in 2016 and revealed shallow bedrock within the harbor basin. The design depth necessary for safe navigation is 16 ft (4.9 m) below mean lower low water (MLLW) with an additional 1-ft (0.3-m) considered as potential additional depth needed to dredge, also termed overdredge allowance. Test probing showed that the top-of-rock elevations within the dredge basin range from approximately 4 ft below MLLW to depths greater than the design elevation (17 ft (5.2 m) below MLLW with overdredge allowance).

During construction the dredging will be conducted first to remove the overburden from the bedrock. A survey will then be conducted to determine the exact extent of bedrock to be removed. The estimated amount of rock excavation is 1,761 yd^3(2,000 yd^3(1,529.1 m^3) permitted volume to account for uncertainty) based on preconstruction surveys. Temporary fill to confine the blast will be placed using conventional construction equipment. A fill is poured over the area where blasting is planned and then the hole for the charges are made beginning in the fill layer. Approximately half of the fill for this temporary pad will be placed above the water line.

Alaska Seismic and Environmental prepared a General Blast Plan and Analysis and sound pressure level (SPL) and sound exposure level (SEL) Isopleth Distances report (Appendix C of the application) detailing the bedrock removal plan and how the exclusion zones for each hearing group were determined. The selected methodology for the blast is to perform two blasts, one per day on two separate days. Each blast will be approximately one (1) second in duration. Both blasts will consist of many detonations separated by some small number of milliseconds delay. The number of charges will vary depending on conditions after overburden is removed but is anticipated to be between 50 and 75 holes with charges per blast. Individual charge size will depend on conditions after holes are drilled; maximum charge size (explosive weight) detonated per each 8-millisecond delay period will be limited to 93.5 pounds (42.4 kilograms).

Individual charge amounts and other hole-loading details will be determined by the contractor's blaster-in-charge and blasting consultant after holes are drilled. This allows for safe and appropriate loading decisions to be made based on rock features such as voids, seams, fractures, and other discontinuities encountered during drilling.

After blasting, the temporary fill will be removed with excavators, loaded into dump trucks, and stockpiled in the uplands to be reused during the MSE wall construction. The blasted material will be excavated, separated from the temporary fill, and hauled offsite to an uplands disposal site.

MSE Wall In-water Fill Placement and Removal

The MSE wall will be constructed with track excavators, loaders, vibratory drum rollers, dump trucks, various hand tools, and labor forces. Excavated material will be placed into dump trucks and hauled offsite. The concrete retaining wall blocks will be set in place one course at a time. Imported fill will be delivered by dump truck, spread behind the blocks in lifts, and compacted with vibratory rollers to meet design grades and compaction requirements. A layer of geotextile fabric will be placed behind the wall on the compacted fill with each course of blocks. A total of 6,800 yd^3 (5,199 m^3) of shot rock material will be placed below the high tide line (HTL) behind the MSE wall.

A 5-ft (1.5-m) thick armored dredge basin slope will require an additional 650 yd^3(497 m^3) of armor rock material, and a lower 2-ft (0.6-m) thick slope will require an additional 1,350 yd^3(1,032.1 m^3) of material. Total fill material placed below the HTL is not expected to exceed 8,800 yd^3(6,728.1 m^3). All work in intertidal zones will be performed during low tides so that all material will be placed above current water levels. Because all material will be placed above current water levels, we do not expect take of marine mammals from this activity.

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

Description of Marine Mammals in the Area of Specified Activities

Seven species of marine mammal have been documented in southeast Alaska waters in the vicinity of Statter Harbor. These species are: harbor seal, harbor porpoise, Dall's porpoise, killer whale, humpback whale, minke whale, and Steller sea lion. Of these species, only three are known to occur in Statter Harbor: harbor seal, Steller sea lion, and humpback whale.

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SAR; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports)* and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (*https://www.fisheries.noaa.gov/find-species*).

Table 1 lists all species with expected potential for occurrence in Statter Harbor and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2017). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS's SARs). While no mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS's U.S. Alaska Region Draft 2018 SAR (Muto *et al*, 2018). All values presented in Table 1 are the most recent available at the time of publication and are available in the Draft 2018 SAR (Muto *et al*, 2018).

Table 1. Species with the Potential to Occur in Statter Harbor.

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance (CV, N_{min}, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)						
Family Balaenopteridae (rorquals)						
Humpback whale	Megaptera noveangliae	Central North Pacific	E, D,Y	10,103 (0.3, 7,891, 2006)	83	26
Minke whale	Balaenoptera acutorostrata	Alaska	-;N	N/A	Und	0
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae						
Killer whale	Orcinus orca	Northern Resident	-;N	261 (N/A, 261, 2011)	1.96	0

Killer whale	Orcinus orca	Gulf of Alaska transient	-;N	587 (N/A, 587, 2012)	5.87	1
Killer whale	Orcinus orca	West Coast Transient	-;N	243 (N/A, 243, 2009)	2.4	0
Family Phocoenidae (porpoises)						
Harbor porpoise	Phocoena phocoena	Southeast Alaska	-; Y	975 (0.14, 872, 2012)	8.7	34
Dall's porpoise	Phocoenoides dalli	Alaska	-;N	83,400 (0.097, N/A, 1991)	Und	38
Order Carnivora – Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions)						
Steller sea lion	Eumetopias jubatus	Western DPS	E/D; Y	54,267 (N/A; 54,267, 2017)	326	252
Steller sea lion	Eumetopias jubatus	Eastern DPS	T/D; Y	41,638 (N/A, 41,638, 2015)	2498	108
Family Phocidae (earless seals)						
Harbor seal	Phoca vitulina	Lynn Canal	-; N	9,478 (N/A, 8,605, 2011)	155	50

1 - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

2- NMFS marine mammal stock assessment reports online at: www.nmfs.noaa.gov/pr/sars/. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable.

3 - These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g*., commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range.

NOTE - Italicized species are not expected to be taken or proposed for authorization

All species that could potentially occur in the proposed survey areas are included in Table 1. It is unlikely the species italicized above in Table 1 are likely to venture far enough into the harbor to enter the acoustic isopleths where we expect take to occur. The spatial occurrence of minke whale and Dall's porpoise is such that take is not expected to occur, and they are not discussed further beyond the explanation provided here. While these species have been sighted in southeast Alaska more broadly, these sightings have been recorded for areas closer to the ocean. Auke Bay is separated from the Pacific by multiple barrier islands and Statter Harbor is located in the most inland section of the bay, making the occurrence of species infrequently sighted farther seaward even less likely. Killer whales are not known to occur frequently in Auke Bay, although they have been sighted infrequently, with no obvious temporal pattern to the sightings. While it is possible killer whales could enter Auke Bay during work, it is unlikely they would continue as far inland as Statter Harbor. If killer whales did venture into Statter Harbor to a distance where acoustic exposure would be a concern, they would be easily identifiable to observers stationed in the harbor for mitigation and monitoring purposes and a shutdown would be ordered. Therefore, take of killer whales from these activities is unlikely to occur and they are not considered further in this document. The work proposed in Statter Harbor is in a very sheltered and inland harbor with a consistent sightings record of the three species considered further: Steller sea lion, humpback whale, and harbor seal. Harbor porpoise, while infrequently sighted near Statter Harbor, are considered further as their fast swim speeds and small size make detection to implement mitigation measures difficult. The species for which take is anticipated are described below.

Humpback whale

Humpbacks that breed around the main Hawaiian Islands have been observed in summer feeding grounds throughout the North Pacific. The majority of the humpbacks found in Southeast Alaska and northern British Columbia have migrated from Hawaii for foraging opportunities and belong to the Hawaii DPS (Bettridge *et al*, 2015). Wade *et al*. (2016) estimated that 93.9 percent of the humpbacks encountered in Southeast Alaska and Northern British Columbia are from the Hawaii DPS, with the remaining percentage of humpbacks coming from the Mexico DPS.

While in their Alaskan feeding grounds, humpback whales prey on a variety of euphausiids and small schooling fishes including herring, smelt, capelin, sandlance, juvenile pollock, and salmon smolts (Kawamura 1980, Krieger and Wing 1986, Witteveen *et al*. 2008, Straley *et al*. 2017, Chenoweth *et al*. 2017). Herring targeted by Southeast Alaska whales in Lynn Canal during 2007-2009 winters were lipid-rich, with energy content ranging from 7.3 – 10.0 kJ/gram (Vollenweider *et al*. 2011). The local distribution of humpbacks in Southeast Alaska appears to be correlated with the density and seasonal availability of prey, particularly herring and euphausiids (Moran *et al*. 2017). Important feeding areas include Glacier Bay and adjacent portions of Icy Strait, Stephens Passage/Frederick Sound, Seymour Canal, Lynn Canal, and Sitka Sound and these areas have been included in the designation of a Biologically Important Area for humpbacks in the Gulf of Alaska. During autumn and winter, the non-breeding season, humpbacks remaining in Southeast Alaska target areas where herring and eulachon are abundant, such as Seymour Canal, Berners Bay, Auke Bay, Lynn Canal, and Stephens Passage (Krieger and Wing 1986, Moran *et al*. 2017). Over 2,940 and 2,019 humpback whale foraging-days were documented in Lynn Canal alone in 2007-2008 and 2008-2009 winter seasons, respectively (Moran *et al*. 2017).

Fidelity to feeding grounds by individual humpbacks is well documented; interchange between Alaskan feeding grounds is rare (Witteveen and Wynne 2017). Long-term research and photo-identification efforts have documented individual humpbacks that have returned to the same feeding grounds for as many 45 years (Straley 2017, Witteveen and Wynne 2017, Gabriele *et al*. 2017). Based on fluke pattern identification, Krieger, Baker and Wing identified 189 unique whales in the Juneau to Glacier Bay and Seymour Canal area (Krieger *et al*. 1986). In recent years, 179 individual humpback whales were identified from the Juneau area, based upon fluke photographs taken between 2006 and 2014 (Teerlink 2017). Humpback whales occur in the project area intermittently year-round. Auke Bay and Statter Harbor are thought to have certain habitat features that attract humpback whales in recent years. The aggregation of herring in inner Auke Bay provide a habitat where whales may make energetic decisions to exploit small volumes of fish and rest to conserve energy between foraging opportunities.

Humpback whales utilize habitats in the project area intermittently. The breakwater and other dock structures appear to serve as fish-attracting devices, where forage fish (herring, capelin, sandlance, pollock, and juvenile salmon) aggregate and are targeted by diving humpback whales. Two humpback whales in recent years have also targeted a shallow trough off the east end of the Statter Harbor breakwater for deeper diving foraging excursions targeting herring and possibly juvenile pollock (Ridgway pers. observ.). Some individual whales enter Auke Bay through the north Coghlan Island entrance and conduct a pattern of exploitation or “browsing” in the bay and inner harbor. In this area some whales lunge feed and gulp massive volumes of feed in seawater immediately adjacent to or rubbing against boats, docks and other structures in deep to shallow waters throughout the action area. These whales have been observed continuing a pattern search alongshore to Auke Creek and up Fritz Cove, where they have been seen lunge feeding in small coves and gullies in shallow water to aggregate schooling fish.

Because humpback whale individuals of different DPS origin are indistinguishable from one another in Alaska (unless fluke patterns are linked to the individual in both feeding and breeding ground), the frequency of occurrence of animals by DPS is only estimated using the DPS ratio, based upon the assumption that the ratio is consistent throughout the Southeast Alaska region (Wade *et al*. 2016).

Harbor seals

The Lynn Canal/Stephens Passage stock is found in the project area waters. The current population estimate for the Lynn Canal/Stephens Passage stock is 9,478 individuals, and the 5-year trend estimate is -176. The probability of decrease of this stock is 0.71, indicating that evidence suggests that the stock is declining, however 9 of the 12 Alaska harbor seal stocks are showing a trend of increasing populations (Muto *et al*. 2018). Typically harbor seals will stay within 16 miles (25 km) of shore, but they have been found up to 62 miles (100 km) from the shore (Klinkhart *et al*. 2008). Harbor seal movement is highly variable, with no seasonal patterns identified.

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

Harbor seals are residents of the project area and observed within the harbor on a regular basis and can be found within the immediate project vicinity on a daily basis. Over the last three winters, a group of up to 12 harbor seals has been observed in inner Statter Harbor near the harbormaster building along with 1-2 dispersed seals near the Auke Creek shoreline (Kate Wynne pers. observ.). Additionally, other counts from 2014- 2016 recorded 2-16 animals within Statter Harbor. Up to 52 individual seals have been photographed simultaneously hauled out on the nearby dock at Fishermen's Bend, located in the northwest corner of Statter harbor (Ridgway unpubl. Data). It is assumed that the majority of animals that haul out on the nearby floats at Fishermen's Bend are likely to go under water and resurface throughout the duration of the project. However, further clarification on the number of individual seals likely to occur in the project area is difficult as harbor seals are not easily identifiable at an individual level.

Steller sea lions

The Steller sea lion was listed as a threatened species under the ESA in 1990 following declines of 63 percent on certain rookeries since 1985 and declines of 82 percent since 1960 (55 FR 12645). In 1997, two DPSs of Steller sea lion were identified based on differences in genetics, distribution, phenotypic traits, and population trends: the Western DPS and Eastern DPS (Fritz *et al*. 2013).

The Eastern DPS (eDPS) is commonly found in the project area waters and were most recently surveyed in Southeast Alaska in June-July of 2015. The current population estimate for the eDPS is 71,562 individuals of which 52,139 are non-pups and 19,423 are pups. In Southeast Alaska the estimated total abundance is 28,594 individuals of which 20,756 are non-pups and 7,838 are pups. The eDPS has been increasing between 1990 to 2015 with an estimated annual increase of 4.76 percent for pups and 2.84 percent for non-pups. (Muto *et al*. 2018) The Western DPS (wDPS) is found infrequently in the project area waters, but have been sighted previously. The current abundance estimate for the US portion of the wDPS is 50,983 of which 12,492 were pups and 38,491 were non- pups. This is the minimum estimate for only the US portion of the wDPS. It is the minimum count because the counts were not corrected for animals at sea during the survey. The overall trend for the wDPS in Alaska is an annual increase of 1.94 percent for non-pups and 1.87 percent for pups. (Muto *et al*. 2018)

There is no critical habitat designated for Steller sea lions within the action area. The action area is located approximately 12 nautical miles (22.22 kilometers) from around Benjamin Island, well outside of the 3,000-ft (914.4-m) designated critical habitat boundary designation.

Steller sea lions occur in Auke Bay in winter on an intermittent basis, but their genetic and stock-designation identities are rarely known: individuals are indistinguishable unless sea lions are branded (and the brand is observed). Satellite-tagged individual animals from the Benjamin Island haulout and Auke Bay were observed multiple times between November 2010 and January 2011 (Fadely 2011), and the Auke Bay boating community frequently observes Steller sea lions moving to and from the haulout complex into Auke Bay.

From 2013-2017, Steller sea lions have been documented in Auke Bay travelling as individuals or in herds of 50 to an estimated 120+ animals, during every month of the winter season. During winter 2015-2016, Steller sea lions foraged aggressively on young herring and 1-2-year-old Walleye pollock for over 20 days, continuously. Some sea lions were also observed consuming small flatfish, likely yellowfin sole, harvested from the seafloor (depth 25-45 m), during this period. While no sea lions were observed hauled out on beaches or structures in the harbor, large rafts of 20-50 animals formed and rested in the outer harbor area between foraging bouts. Simultaneous surface counts of 121 individual sea lions suggests that likely upwards of 200 animals or more were targeting prey in Statter Harbor during herring aggregation events. These 121 to 200 animals comprise roughly 20 to 30 percent of the animals typically found at the Benjamin Island and Little Island haulout complexes during winter months. (Ridgway pers. observ.)

Only three individual, branded wDPS Steller sea lions have been observed at Benjamin Island, the closest haulout, from 2003-2006 with a maximum of 3 sightings per individual. No branded wDPS individuals have been observed in the ADF&G surveys from 2007-2016. The 2007 ADF&G surveys offer the most abundant data for Steller sea lion counts at Benjamin Island. A total of 11 surveys were conducted between January and July 2017, ranging from 0-

768 Steller sea lions, with an average count of 404 individuals. In 2007 no wDPS animals were observed. While it is possible an individual from the wDPS may be at the Benjamin Island haulout, it is rare, and none have been documented at this haulout for the last decade (Jemison pers. comm. 2017).

Although recent data in the northern part of the eastern DPS indicate movement of western sea lions east of the 144° line, the mixed part of the range remains small (Jemison *et al*. 2013). Based on observations by ADF&G over the last decade this project is unlikely to impact wDPS individuals. A recent IHA application for the Haines Ferry Terminal indicated that using branded animal ratios, a conservative estimate of 1.6 percent eDPS individuals may occur at the Gran Point haulout based on personal communication the applicant had with the Alaska Regional Office (shown in Figure 5 in the application). To be conservative it is assumed that 2 percent of the Steller sea lions at in this project area may be from the wDPS.

Harbor porpoise

In Alaska, harbor porpoises are currently divided into three stocks, based primarily on geography: (1) the Southeast Alaska stock - occurring from the northern border of British Columbia to Cape Suckling, Alaska, (2) the Gulf of Alaska stock - occurring from Cape Suckling to Unimak Pass, and (3) the Bering Sea stock - occurring throughout the Aleutian Islands and all waters north of Unimak Pass. Only the Southeast Alaska stock is considered in this proposed IHA because the other stocks are not found in the geographic area under consideration.

There are no subsistence uses of this species; however, as noted above, entanglement in fishing gear contributes to human-caused mortality and serious injury. Muto *et al*. (2018) also reports harbor porpoise are vulnerable to physical modifications of nearshore habitats resulting from urban and industrial development (including waste management and nonpoint source runoff) and activities such as construction of docks and other over-water structures, filling of shallow areas, dredging, and noise (Linnenschmidt *et al*., 2013).

Information on harbor porpoise abundance and distribution in Auke Bay has not been systematically collected. While sightings of harbor porpoise in Statter Harbor are rare, they are an inconspicuous species, often traveling alone or in pairs, difficult for marine mammal observers to sight, making any approach to a monitoring zone potentially difficult to detect. The applicant did not request authorization of take of harbor porpoise because they are not known to regularly occur in the vicinity of the project site. However, because the species has been rarely observed in the area and due to the difficulty of implementing mitigation sufficient to avoid incidental take of animals that do occur in the area, we have determined it appropriate to propose authorization of take of harbor porpoise

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e*., low-frequency cetaceans).

Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibels (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. The functional groups and the associated frequencies are indicated below (note that these frequency ranges correspond to the range for the composite group, with the entire range not necessarily reflecting the capabilities of every species within that group):

- Low-frequency cetaceans (mysticetes): generalized hearing is estimated to occur between approximately 7 hertz (Hz) and 35 kilohertz (kHz);
- Mid-frequency cetaceans (larger toothed whales, beaked whales, and most delphinids): generalized hearing is estimated to occur between approximately 150 Hz and 160 kHz;
- High-frequency cetaceans (porpoises, river dolphins, and members of the genera *Kogia* and Cephalorhynchus; including two members of the genus Lagenorhynchus, on the basis of recent echolocation data and genetic data): generalized hearing is estimated to occur between approximately 275 Hz and 160 kHz.
- Pinnipeds in water; Phocidae (true seals): generalized hearing is estimated to occur between approximately 50 Hz to 86 kHz;
- Pinnipeds in water; Otariidae (eared seals): generalized hearing is estimated to occur between 60 Hz and 39 kHz.

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

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Four marine mammal species (two cetacean and two pinniped (one otariid and one phocid) species) have the reasonable potential to co-occur with the proposed survey activities. Please refer to Table 1. Of the cetacean species that may be present, humpback whales are classified as low-frequency cetaceans, and harbor porpoise are classified as high-frequency cetaceans.

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The *Estimated Take by Incidental Harassment* section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The *Negligible Impact Analysis and Determination* section considers 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 these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

Description of Sound

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 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. Amplitude is the height of the sound pressure wave or the `loudness' of a sound and is typically measured using the 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 SPLs(the sound force per unit area), sound is referenced in the context of underwater sound pressure to one 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 kilohertz (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; and
- Anthropogenic: Sources of ambient noise related to human activity include transportation (surface vessels and aircraft), dredging and construction, oil and gas drilling and production, seismic surveys, sonar, explosions, and ocean acoustic studies. Shipping noise typically dominates the total ambient noise for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly (Richardson *et al*., 1995). Sound from identifiable anthropogenic sources other than the activity of interest (*e.g.*, a passing vessel) is sometimes termed background sound, as opposed to ambient sound.

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

Description of Sounds Sources

In-water construction activities associated with the project would include vibratory pile removal, dredging, and blasting. Sound sources can be divided into broad categories based on various criteria or for various purposes. With regard to temporal properties, sounds are generally considered to be either continuous or transient (*i.e*., intermittent). Continuous sounds are simply those whose sound pressure level remains above ambient sound during the observation period (ANSI, 2005). Intermittent sounds are defined as sounds with interrupted levels of low or no sound (NIOSH, 1998). Sound sources may also be categorized based on their potential to damage hearing. The sounds produced by these activities fall into one of two general sound types: Impulsive and non-impulsive (defined in the following). 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.

Impulsive sound sources (*e.g*., explosions, gunshots, sonic booms, impact pile driving) are by definition intermittent, and 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. Impulsive 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-impulsive sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or intermittent (ANSI 1995; NIOSH 1998). Some of these non-impulsive sounds can be transient signals of short duration but without the essential properties of impulses (*e.g.*, rapid rise time). Examples of non-impulsive sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems. The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

The use of explosives for two days of blasting, is considered an impulsive sound, which is characterized by a short duration, abrupt onset, and rapid decay. Exposure to high intensity sound may result in behavioral reactions and auditory effects such as a noise-induced threshold shift—an increase in the auditory threshold after exposure to noise (Finneran *et al*., 2005). The proposed project also includes the use of various low-level non-impulsive acoustic sources including dredging, that would consistently emit noise for an extended period of time (up to 45 days) and increase vessel traffic in the vicinity of a small harbor. The source levels as well as impacts from dredging and fill placement activities are sources with generally lower source levels than many other sources we consider and are not thought to be dissimilar to ambient noise levels in an area with sustained anthropogenic activity and vessel traffic, such as Statter Harbor, and may range from having the potential to cause Level B harassment to exposure to noise that does not result in harassment. Here, we make conservative assessments of the potential to harass marine mammals incidental to the project and, in the Estimated Take section, accordingly propose to authorize take, by Level B harassment only for some of these lesser known sources.

Acoustic Impacts

Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic sources can potentially result in one or more of the following; temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al*., 1995; Gordon *et al*., 2004; Nowacek *et al*., 2007; Southall *et al*., 2007; Gotz *et al*., 2009). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. We first describe specific manifestations of acoustic effects before providing discussion specific to the City of Juneau's construction activities.

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

We describe the more severe effects (*i.e*., permanent hearing impairment, certain non-auditory physical or physiological effects) only briefly as we do not expect that there is a reasonable likelihood that the City of Juneau’s activities may result in such effects (see below for further discussion). Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Kastak *et al*., 1999; Schlundt *et al*., 2000; Finneran *et al*., 2002, 2005b). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al*., 2007). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter 1985).

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

Relationships between TTS and PTS thresholds have not been studied in marine mammals—PTS data exists only for a single harbor seal (Kastak *et al*., 2008)—but are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several dB above that which induces mild TTS: a 40-dB threshold shift approximates PTS onset; *e.g*., Kryter *et al*., 1966; Miller, 1974), whereas a 6-dB threshold shift approximates TTS onset (*e.g*., Southall *et al*., 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse sounds (such as bombs) are at least 6 dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level thresholds are 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall *et al*., 2007). Given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur.

TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter 1985). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals.

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (*i.e*., recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious. For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during a time when communication is critical for successful mother/calf interactions could have more serious impacts.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin (*Tursiops truncatus*), beluga whale (*Delphinapterus leucas*), harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*) and three species of pinnipeds (northern elephant seal (*Mirounga angustirostris*), harbor seal, and California sea lion (*Zalophus californianus*)) exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (*e.g.*, Finneran *et al*., 2002; Nachtigall *et al*., 2004; Kastak *et al*., 2005; Lucke *et al*., 2009; Popov *et al*., 2011). In general, harbor seals (Kastak *et al*., 2005; Kastelein *et al*., 2012a) and harbor porpoises (Lucke *et al*., 2009; Kastelein *et al*., 2012b) have a lower TTS onset than other measured pinniped or cetacean species. Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. There are no data available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Finneran (2015).

Physiological Effects

In addition to PTS and TTS, there is a potential for non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to high level underwater sound or as a secondary effect of extreme behavioral reactions (*e.g.*, change in dive profile as a result of an avoidance reaction) caused by exposure to sound. These impacts can include neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al*., 2006; Southall *et al*., 2007; Zimmer and Tyack 2007). The City of Juneau's activities involve the use of devices such as explosives, which has been associated with these types of effects. The underwater explosion will send a shock wave and blast noise through the water, release gaseous by-products, create an oscillating bubble, and cause a plume of water to shoot up from the water surface. The shock wave and blast noise are of most concern to marine animals. The effects of an underwater explosion on a marine mammal depends on many factors, including the size, type, and depth of both the animal and the explosive charge; the depth of the water column; and the standoff distance between the charge and the animal, as well as the sound propagation properties of the environment. Potential impacts can range from brief effects (such as behavioral disturbance), tactile perception, physical discomfort, slight injury of the internal organs and the auditory system, to death of the animal (Yelverton *et al*., 1973; DoN, 2001). Non-lethal injury includes slight injury to internal organs and the auditory system; however, delayed lethality can be a result of individual or cumulative sublethal injuries (DoN, 2001). Immediate lethal injury would be a result of massive combined trauma to internal organs as a direct result of proximity to the point of detonation (DoN 2001). Generally, the higher the level of impulse and pressure level exposure, the more severe the impact to an individual.

Injuries resulting from a shock wave take place at boundaries between tissues of different density. Different velocities are imparted to tissues of different densities, and this can lead to their physical disruption. Blast effects are greatest at the gas-liquid interface (Landsberg 2000). Gas-containing organs, particularly the lungs and gastrointestinal (GI) tract, are especially susceptible (Goertner 1982; Hill 1978; Yelverton *et al*., 1973). In addition, gas-containing organs including the nasal sacs, larynx, pharynx, trachea, and lungs may be damaged by compression/expansion caused by the oscillations of the blast gas bubble. Intestinal walls can bruise or rupture, with subsequent hemorrhage and escape of gut contents into the body cavity. Less severe GI tract injuries include contusions, petechiae (small red or purple spots caused by bleeding in the skin), and slight hemorrhaging (Yelverton *et al*., 1973).

Because the ears are the most sensitive to pressure, they are the organs most sensitive to injury (Ketten 2000). Sound-related damage associated with blast noise can be theoretically distinct from injury from the shock wave, particularly farther from the explosion. If an animal is able to hear a noise, at some level it can damage its hearing by causing decreased sensitivity (Ketten 1995). Sound-related trauma can be lethal or sublethal. Lethal impacts are those that result in immediate death or serious debilitation in or near an intense source and are not, technically, pure acoustic trauma (Ketten 1995). Sublethal impacts include hearing loss, which is caused by exposures to perceptible sounds. Severe damage (from the shock wave) to the ears includes tympanic membrane rupture, fracture of the ossicles, damage to the cochlea, hemorrhage, and cerebrospinal fluid leakage into the middle ear. Moderate injury implies partial hearing loss due to tympanic membrane rupture and blood in the middle ear. Permanent hearing loss also can occur when the hair cells are damaged by one very loud event, as well as by prolonged exposure to a loud noise or chronic exposure to noise. The level of impact from blasts depends on both an animal's location and, at outer zones, on its sensitivity to the residual noise (Ketten 1995).

The above discussion concerning underwater explosions only pertains to open water detonations in a free field without mitigation. Therefore, given the low weight of the charges and small size of the detonation relative to large open water detonations in conjunction with monitoring and mitigation measures discussed below, The City of Juneau’s two blasting events are not likely to have injury or mortality effects on marine mammals in the project vicinity. Instead, NMFS considers that The City of Juneau 's blasts are most likely to cause behavioral harassment and may cause TTS in a few individual marine mammals, as discussed below.

Behavioral Effects

Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.*, minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.*, species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g*., Richardson *et al*., 1995; Wartzok *et al*., 2003; Southall *et al*., 2007; Weilgart, 2007; Archer *et al*., 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al*., 2012), and can vary depending on characteristics associated with the sound source (*e.g*., whether it is moving or stationary, number of sources, distance from the source). Please see Appendices B-C of Southall *et al*. (2007) for a review of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al*., 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a “progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial,” rather than as, more generally, moderation in response to human disturbance (Bejder *et al*., 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. As noted, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al*., 1995; NRC 2003; Wartzok *et al*., 2003). Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al*., 1997; Finneran *et al*., 2003). Observed responses of wild marine mammals to loud, intermittent sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; see also Richardson *et al*., 1995; Nowacek *et al*., 2007).

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, l*et al*one the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g*., Lusseau and Bejder 2007; Weilgart 2007; NRC 2005). This highlights the importance of assessing the context of the acoustic effects alongside the received levels anticipated. Severity of effects from a response to an acoustic stimuli can likely vary based on the context in which the stimuli was received, particularly if it occurred during a biologically sensitive temporal or spatial point in the life history of the animal. There are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

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

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

Variations in respiration naturally vary with different behaviors and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g*., Kastelein *et al*., 2001, 2005b, 2006; Gailey *et al*., 2007).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al*., 2000; Fristrup *et al*., 2003; Foote *et al*., 2004), while right whales (Eubalaena glacialis) have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al*., 2007b). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al*., 1994).

Avoidance is the displacement of an individual from an area or migration path because of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al*., 1995). For example, gray whales (Eschrictius robustus) are known to change direction—deflecting from customary migratory paths—in order to avoid noise from seismic surveys (Malme *et al*., 1984). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g*., Bowles *et al*., 1994; Goold, 1996; Stone *et al*., 2000; Morton and Symonds, 2002; Gailey *et al*., 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g*., Blackwell *et al*., 2004; Bejder *et al*., 2006; Teilmann *et al*., 2006).

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

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

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

Stress Response

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

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

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

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well studied through controlled experiments and for both laboratory and free-ranging animals (*e.g*., Holberton *et al*., 1996; Hood *et al*., 1998; Jessop *et al*., 2003; Krausman *et al*., 2004; Lankford *et al*., 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker 2000; Romano *et al*., 2002b) and, more rarely, studied in wild populations (*e.g*., Romano *et al*., 2002a). For example, Rolland *et al*. (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003).

Acoustic Effects, Underwater

The effects of sounds from The City of Juneau's proposed activities might include one or more of the following: Temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, and masking (Richardson *et al*., 1995; Gordon *et al*., 2003; Nowacek *et al*., 2007; Southall *et al*., 2007). The effects of pile removal or dredging on marine mammals are dependent on several factors, including the type and depth of the animal; the pile size and type, and the intensity and duration of the pile removal or dredging sound; the substrate; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile removal and dredging activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the frequency, received level, and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. The characteristics of dredging noise are such that there is a clear impulse peak, from the impact of the dredge making contact with the substrate, but then there is a prolonged period of sound which is the noise of the continual operation of the dredge delving the sediment. As such, we have chosen to consider the characteristics noise as a continuous source despite the impulse at the beginning of the waveform characterizing dredging noise. 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 extract the pile or dredge the substrate, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

In the absence of mitigation, impacts to marine species could be expected to include physiological and behavioral responses to the acoustic signature (Viada *et al*., 2008). Potential effects from impulsive sound sources like blasting can range in severity from effects such as behavioral disturbance to temporary or permanent hearing impairment (Yelverton *et al*., 1973). Due to the nature of the sounds involved in the project, behavioral disturbance is the most likely effect from the proposed activity. Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shifts. PTS constitutes injury, but TTS does not (Southall *et al*., 2007). Due to the use mitigation measures discussed in detail in the Proposed Mitigation Section, it is unlikely but possible that PTS could occur from blasting.

Disturbance Reactions

Responses to continuous sound, such as vibratory pile installation, have not been documented as well as responses to intermittent sounds. With pile removal as well as dredging activities, it is likely that the onset of sound sources 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 haulouts or rookeries). Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). If a marine mammal responds to a stimulus by changing its behavior (*e.g*., through relatively minor changes in locomotion direction/speed or vocalization behavior), the response may or may not constitute taking at the individual level, and is unlikely to affect the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on animals, and if so potentially on the stock or species, could potentially be significant (*e.g*., Lusseau and Bejder 2007; Weilgart 2007).

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

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

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

Auditory Masking

Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g*., those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al*., 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g*., snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g*., shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g*., signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g*., sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is man-made, it may be considered harassment when disrupting or altering critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

The frequency range of the potentially masking sound is important in determining any potential impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.*, Clark *et al*., 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.*, Miller *et al*., 2000; Foote *et al*., 2004; Parks *et al*., 2007b; Di Iorio and Clark 2009; Holt *et al*., 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al*., 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore 2014). Masking can be tested directly in captive species (*e.g.*, Erbe 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.*, Branstetter *et al*., 2013).

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

Anticipated Effects on Habitat

The proposed activities at the project area would not result in permanent negative impacts to habitats used directly by marine mammals, but may have potential short-term impacts to food sources such as forage fish and may affect acoustic habitat. There are no known foraging hotspots or other ocean bottom structure of significant biological importance to marine mammals present in the marine waters of the project area during the construction window other than the occurrence of the foraging BIA for humpback whales. While humpbacks are known to feed in Statter Harbor, this is a small portion of the overall area designated as important. The small portion of the BIA affected by the construction noise, in conjunction with the short temporal scale of construction activity (57 days, only in daylight hours) make it unlikely the effects of the construction will significantly alter the foraging habitat of humpbacks in southeast Alaska. Therefore, the main impact issue associated with the proposed activity would be temporarily elevated sound levels and the associated direct effects on marine mammals, as discussed previously in this document. The primary potential acoustic impacts to marine mammal habitat are associated with elevated sound levels produced by pile removal, dredging, and blasting in the area. However, other potential impacts to the surrounding habitat from physical disturbance are also possible.

In-water Construction Effects on Potential Prey (Fish)

Construction activities would produce continuous (*i.e.*, vibratory pile removal and dredging) and pulsed (blasting) 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 impulsive sounds such as 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 removal and dredging 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. While impacts from blasting to fish are more severe, including barotrauma and mortality, the blast will last approximately one second on each of two days, making the duration of this impact short term. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the short timeframe for the project.

Effects on Potential Foraging Habitat

The area likely impacted by the project is relatively small compared to the available habitat in Auke Bay (*e.g.*, most of the impacted area is limited near the northwest corner of the bay). Avoidance by potential prey (*i.e.*, fish) of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish avoidance of this area after construction activity stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity in Auke Bay.

The duration of the construction activities is relatively short. The construction window is for a maximum of 57 days and each day, construction activities would occur for less than half of the day. Impacts to habitat and prey are expected to be minimal based on the short duration of activities.

In summary, given the short daily duration of sound associated with individual construction activities and the relatively small areas being affected, the proposed action are not likely to have a permanent, adverse effect on any fish habitat, or populations of fish species. Thus, any impacts to marine mammal habitat are not expected to cause significant or long-term consequences for individual marine mammals or their populations.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through this IHA, which will inform both NMFS' consideration of "small numbers" and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. 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).

Authorized takes would primarily be by Level B harassment, as use of the explosives, vibratory pile removal, and dredging has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury and (Level A harassment) to result from blasting, primarily for high frequency species and phocids because predicted auditory injury zones are larger than for low-frequency species and otariids. The proposed mitigation and monitoring measures are expected to minimize the severity of such taking to the extent practicable.

As described previously, no mortality is anticipated or proposed to be authorized for this activity. Below we describe how the take is estimated.

Generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) and the number of days of activities. We note that while these basic factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.*, previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the proposed take estimate.

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment). Thresholds have also been developed to identify the pressure levels above which animals may incur different types of tissue damage from exposure to pressure waves from explosive detonation.

Level B Harassment for non-explosive sources – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle), the environment (*e.g.*, bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.*, 2007, Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. This threshold is not applied to single detonations as the sound is instantaneous in nature such that a behavioral harassment is not expected to result, although TTS may occur. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa (rms) for continuous (*e.g.*, vibratory pile-driving, drilling) and above 160 dB re 1 μPa (rms) for intermittent (*e.g.*, impact pile driving) sources.

The City of Juneau's proposed activity includes the use of continuous sounds (vibratory pile removal, dredging) and therefore the 120 dB re 1 μPa (rms) threshold for behavioral harassment is applicable. While the proposed activity also includes impulsive sounds (blasting), the160 dB re 1 1 μPa (rms) threshold for behavioral harassment is not applicable, as behavioral harassment is not expected from single detonation events, although TTS is possible.

Level A harassment for non-explosive sources - NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). The City of Juneau's proposed activity includes the use non-impulsive (dredging, vibratory pile removal) sources.

These thresholds are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at: *http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm*.

Table 2. Thresholds identifying the onset of Permanent Threshold Shift.

	PTS Onset Acoustic Thresholds* (Received Level)	
Hearing Group	**Impulsive**	**Non-impulsive**
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	*Cell 2* $L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	*Cell 4* $L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	*Cell 6* $L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	*Cell 8* $L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	*Cell 10* $L_{E,OW,24h}$: 219 dB

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (L_{pk}) has a reference value of 1 µPa, and cumulative sound exposure level (L_E) has a reference value of 1µPa²s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

Explosive sources – Based on the best available science, NMFS uses the acoustic and pressure thresholds indicated in Table 3 to predict the onset of behavioral harassment, PTS, tissue damage, and mortality.

Table 3. Explosive acoustic and pressure thresholds for marine mammals.

Group	Level B harassment		Level A harassment	Serious injury		Mortality
	Behavioral (multiple detonations)	TTS	PTS	Gastro-intestinal tract	Lung	
Low-freq cetacean	163 dB SEL	168 dB SEL or 213 dB SPL_{pk}	183 dB SEL or 219 dB SPL_{pk}	237 dB SPL	$39.1M^{1/3}$ $(1+[D/10.081])^{1/2}$ Pa-sec where: M = mass of the animals in kg D = depth of animal in m	$91.4M^{1/3}$ $(1+[D/10.081])^{1/2}$ Pa-sec where: M = mass of the animals in kg D = depth of animal in m
High-freq cetacean	135 dB SEL	140 dB SEL or 196 dB SPL_{pk}	155 dB SEL or 202 dB SPL_{pk}			
Phocidae	165 dB SEL	170 dB SEL or 212 dB SPL_{pk}	185 dB SEL or 218 dB SPL_{pk}			
Otariidae	183 dB SEL	188 dB SEL or 226 dB_{pk}	203 dB SEL or 232 dB SPL_{pk}			

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds, which include source levels and transmission loss coefficient.

Vibratory removal - The closest known measurements of vibratory pile removal similar to this project are from the Kake Ferry Terminal project for vibratory extraction of an 18-in steel pile. The extraction of 18-in steel pipe pile using a vibratory hammer resulted in underwater noise levels reaching 156.2 dB RMS at 7 m (Denes *et al*. 2016). The pile diameters for the proposed project are smaller, thus the use of noise levels associated with the pile extraction at Kake may be somewhat conservative. For timber pile removal, the Seattle Pier 62/63 sound source verification report contains an appendix with source measurements at different distances for 63 individual pile removals (WSDOT, 2015). When the data are normalized to 10 m, the median source level is 152 dB RMS at 10 m.

Dredging - For dredging, sound source data was used from bucket dredging operations in Cook Inlet, Alaska (Dickerson *et al*. 2001). Dredging in that project consisted of six distinct events, including the bucket striking the channel bottom, bucket digging, winch in/out as the bucket is lowered/raised, dumping of the material on the barge and emptying the barge at the disposal site. Although the waveform of the bucket strike has a high peak sound pressure with rapid rise time and rapid decay (characteristics typical of an impulsive sound source), the duration of the source signal was longer than what is often considered for an impulsive sound source, about 50 seconds, which is the approximate duration of one continuous noise signal from the dredging equipment. The events following the initial waveform impulse were of longer duration and were non-impulsive in form and therefore dredging was analyzed as a continuous source. Dickerson *et al* (2001) took 104 SPL RMS measurements for the first five distinct phases of the dredging cycle and averaged them, including the impulse in the waveform of the dredge making contact with the substrate. These averages were distance corrected to determine an average SPL of 150.5 dB RMS at 1 m for the bucket dredging process, with an assumed maximum duration of up to 50 seconds, of non-impulsive, continuous noise.

Blasting - Historic data from an analog project were analyzed to create a conservative attenuation model for anticipated pressure levels from confined blasting in drilled shafts in underwater bedrock. Sound pressure data from the analog project was analyzed to compare source pressure levels to received impulse levels (Alaska Seismic, 2018). These models were used to predict distances to the peak level and impulse thresholds summarized above in Table 3. Cumulative source levels from the analog project were used in conjunction with the NMFS 2018 updated User Spreadsheet Tool for predicting threshold shift isopleths for multiple detonations, after being corrected to a 1-m reference source level. The median of 10 measurements, consisting of detonations ranging from 19 to 78 individual holes for the detonation, resulted in a source level of 227.98 dB single shot SEL.

When the NMFS Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, NMFS developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of Level A harassment take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources, the NMFS User Spreadsheet predicts the closest distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would not incur PTS. Inputs used in the User Spreadsheet, and the resulting isopleths are reported below.

Table 4. NMFS User Spreadsheet Inputs.

	Timber removal	Steel removal	Dredging	Blasting
Spreadsheet Tab Used	A.1: Vibratory Pile Driving	A.1: Vibratory Pile Driving	A: Stationary: Non-impulsive, Continuous	E.2: Explosives: Impulsive, Intermittent (Multiple detonations)
Source Level (Single Strike/shot SEL)				227.975
Source Level (RMS SPL)	152	156.2	150.5	
Weighting Factor Adjustment (kHz)	2.5	2.5	2	1
a) Number of strikes/detonations in 1 h				1
a) Activity Duration (h) within 24-h period			11	1
Propagation (xLogR)	15	15	15	20
Distance of source level measurement (m)+	10	7	1	-
# of piles/shots in a 24 h period	16	4		1
Duration to drive (remove) a single pile (min)	20	20		

When using the inputs from Table 4, the outputs generated are summarized below in Table 5.

Table 5. NMFS User Spreadsheet Generated Outputs.

USER SPREADSHEET OUTPUT				
	PTS Isopleth (meters)			
Source Type	**Low-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
Timber removal	5.2	7.7	3.2	0.2
Steel Removal	2.8	4.1	1.7	0.1
Dredging	0.7	0.6	0.4	0.0
Blasting (SELcum)*	176	59.1	71.4	10.1
Blasting (PK)*	22.1	156.5	24.8	4.9
TTS Isopleth (meters)				
Blasting (SEL cum)*	989.8	332.3	401.7	56.9
Blasting (PK)*	44.1	312.2	49.5	9.9
	Level B Behavioral Harassment Isopleth (meters)			
Timber removal	1359.36			
Steel removal	1813.14			
Dredging	107.98			

*Impulsive sounds have a dual metric threshold (SELcum and PK). Metric producing the largest isopleth should be used.

Marine Mammal Occurrence

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations. Reliable densities are not available for Statter Harbor or the Auke Bay area. Generalized densities for the North Pacific would not be applicable given the high variability in occurrence and density at specific inlets and harbors. Therefore, the applicant consulted opportunistic sightings data from oceanographic surveys in Auke Bay and sightings from Auke Bay Marine Station observation pier for this specific harbor to arrive at a number of animals expected to occur within the harbor per day. For humpback whales, it is assumed that a maximum of two animals per day are likely to be seen in the harbor. For Steller sea lions, the potential maximum daily occurrence of animals is 121 individuals within the harbor. For harbor seals, the maximum daily occurrence of animals is 52 individuals.

Take Calculation and Estimation

Here we describe how the information provided above is brought together to produce a quantitative take estimate.

Because reliable densities are not available, the applicant requests take based on the above mentioned maximum number of animals that may occur in the harbor per day multiplied by the number of days of the activity. The applicant varied these calculations based on certain factors.

Humpback whale - Based on the size of the harassment zone for dredging, in combination with the Proposed Mitigation outlined below, the applicant does not expect humpback whales to approach the dredging vessel and therefore is not requesting take of humpback whales from dredging. Because of the nature of blasting, there is no behavioral threshold associated with the activity, but TTS, which is a form of Level B harassment take, may occur. With a maximum take of two animals per day, multiplied by a maximum of 10 days of pile removal and two days of blasting (TTS), the applicant requests authorization of 24 Level B harassment takes of humpback whale.

Steller sea lion – It is estimated that a maximum of 121 Steller sea lions may be seen in Statter Harbor within one day. A maximum take of 121 animals per day for 10 days of pile removal is 1,210 Steller sea lions. Given the size of the Level B zone for dredging (108 m), it is possible Steller sea lions may approach the source vessel. However, given the small size of the zone, the applicant reduced the number of animals expected to be taken daily from dredging by 50 percent, to 60 Steller sea lions daily. A maximum of 60 takes per day for 45 days of dredging is 2,700 takes of Steller sea lion. For blasting, which is confined to the inner harbor, the TTS zone (57 m) is even smaller than the size of the dredging zone. Therefore, if the same maximum of 60 Stellers is assumed to be within the zone for two days of blasting, the result is a potential take of 120 Steller sea lions. No more than 20 of those Steller sea lions are assumed to be within range of the PTS blasting isopleths, with the remaining 100 takes potentially occurring in the TTS isopleth. While it is conservative to assume 20 Steller sea lions may occur within 10 meters of the blast source, they are regularly seen in the area and the explosives need to be detonated within a certain number of hours after being planted. It is possible that Stellers could approach the source and the detonation could no longer be delayed, exposing Steller sea lions to sound levels that may induce PTS. This adds to a total of 4,030 takes of Steller sea lion.

Harbor seal – The largest known group size to occur in Statter Harbor is 52 individuals, which is the maximum number of takes per day used in the take estimation section for harbor seals. For 10 days of pile removal, using an assumed rate of 52 individuals per day, the potential take of harbor seals is 520. For 45 days of dredging, the estimated daily take was reduced by half due to the small size of the isopleth, resulting in an estimate of 1,170 takes. For blasting, it is assumed no more than 11 harbor seals would enter the inner harbor on a given day and therefore could occur within 71 meters of the blasting source. This results in a potential 22 Level A harassment takes of harbor seal due to blasting across two days. For the TTS blasting zone, which is 400 meters, 52 harbor seals could occur in the harbor area and were used to estimate a potential 104 TTS takes of harbor seal across two days of blasting. Summed together, this would result in 1,186 takes of harbor seal.

Harbor porpoise – Very little is known about likelihood of occurrence of harbor porpoise in Statter Harbor but, as noted previously, they are rarely observed in the area and we assume that may occur, while their cryptic nature makes it difficult to mitigate all potential for take. If it is assumed one pair could be sighted per day for 10 days of pile removal, this would result in potential take of 20 harbor porpoise. If the same methodology is applied, assuming a pair per two days on 45 days of dredging because of the infrequency of harbor porpoise and the size of the isopleth, this would result in take of 44 estimated harbor porpoise. For two days of blasting, it is assumed two harbor porpoise may occur each day in the TTS zone, for four total TTS takes, and one pair on each day may appear in the PTS zone, resulting in four Level A harassment takes of harbor porpoise.

The total number of takes proposed are summarized in Table 6 below.

Table 6. Takes Proposed to be Authorized.

	Takes from Pile Removal	**Takes from Dredging**	**TTS Takes from Blasting**	**PTS Takes from Blasting**	**Total Level B harassment Takes**	**Total Level A harassment Takes**
Humpback whale	20	0	4	0	**24**	**0**
Steller sea lion	1,210	2,700	100	20	**4,010**	**20**
Harbor seal	520	1,170	104	22	**1,794**	**22**

Harbor porpoise	20	44	4	4	**68**	**4**

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 (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11).

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

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

(2) the practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity,

personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

In addition to the measures described later in this section, the City of Juneau will employ the following standard mitigation measures:

- Conduct a briefing between construction supervisors and crews and the marine mammal monitoring team prior to the start of construction, and when new personnel join the work, to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures;

- For in-water and over-water heavy machinery work, if a marine mammal comes within 10 m, operations must cease and vessels must reduce speed to the minimum level required to maintain steerage and safe working conditions. This 10 m shutdown encompasses the Level A harassment zone for pile removal and dredging and therefore this requirement is not listed separately.

- Work may only occur during daylight hours, when visual monitoring of marine mammals can be conducted;

- For those marine mammals for which Level B harassment take has not been requested, pile removal and dredging will shut down immediately when the animals are sighted approaching the monitoring zones;

- If take reaches the authorized limit for an authorized species, activity for which take is authorized will be stopped as these species approach the monitoring zones to avoid additional take of them.

The following measures would apply to The City of Juneau's mitigation requirements:

Establishment of Monitoring Zones for Level B— The City of Juneau will establish Level B monitoring zones or zones of influence (ZOI) which are areas where SPLs are equal to or exceed the 120 dB rms threshold during vibratory removal and dredging. Similar harassment monitoring zones will be established for the TTS isopleths associated with each functional hearing group for blasting activities. Monitoring zones provide utility for observing by establishing monitoring protocols for areas adjacent to the shutdown zones. Monitoring zones enable observers to be aware of and communicate the presence of marine mammals in the project area outside the shutdown zone and thus prepare for a potential cease of activity should the animal enter the shutdown zone. The Level B monitoring zones are depicted in Table 7.

Table 7. Shutdown and Monitoring Zones.

	Monitoring Zones				Shutdown Zones
Source	High Frequency Cetacean	Low Frequency Ceteacean	Phocid	Otariid	All species
Vibratory Removal – Steel	1,820 m	1,820 m	1,820 m	1,820 m	10 m
Vibratory Removal – Timber	1,360 m	1,360 m	1,360 m	1,360 m	10 m
Dredging	110 m	110 m	110 m	110 m	10 m
Blasting (PTS)	160 m	180 m	80 m	10 m	10 m
Blasting (TTS)	340 m	990 m	410 m	60 m	10 m

As shown, the largest Level B zone is equal to 1,820 m, making it unlikely that PSOs would be able to view the entire harassment area. Due to this, Level B exposures will be recorded and extrapolated based upon the number of observed take and the percentage of the Level B harassment zone that was not visible.

Pre-Activity Monitoring - Prior to the start of daily in-water activity, or whenever a break in activity of 30 minutes or longer occurs, the observer will observe the shutdown and monitoring zones for a period of 30 minutes. The shutdown zone will be cleared when a marine mammal has not been observed within the zone for that 30-minute period. If a marine mammal is observed within the shutdown zone, activity cannot proceed until the animal has left the zone or has not been observed for 15 minutes. If the Level B harassment zone has been observed for 30 minutes and non-permitted species are not present within the zone, activity can commence and work can continue even if visibility becomes impaired within the Level B zone. When a marine mammal permitted for Level B take is present in the Level B harassment zone, activities may begin and Level B take will be recorded. As stated above, if the entire Level B zone is not visible at the start of construction, activity can begin. If work ceases for more than 30 minutes, the pre-activity monitoring of both the Level B and shutdown zone will commence.

For blasting, the TTS zone will be monitored for a minimum of 30 minutes prior to detonating the blasts. If a marine mammal is sighted within the TTS zone, blasting will be delayed until the zone is clear of marine mammals for 30 minutes. This will continue as long as practicable within the constraints of the blasting design but not beyond sunset on the same day as the charges cannot lay dormant for more than 24 hours, which may force the detonation of the blast in the presence of marine mammals. Charges will be laid as early as possible in the morning.

Based on our evaluation of the applicant's proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means effecting the least practicable impact on the affected 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 IHA for an activity, Section 101(a)(5)(D) of the MMPA states that NMFS must set forth, requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;

- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

Visual Monitoring

Monitoring would be conducted 30 minutes before, during, and 30 minutes after construction activities. In addition, observers must record all incidents of marine mammal occurrence, regardless of distance from activity, and must document any behavioral reactions in concert with distance from construction activities.

PSOs would be land-based observers. Observers will be stationed at locations that provide adequate visual coverage for shutdown and monitoring zones. Potential observation locations are depicted in Figures 2 and 3 of the applicant's Marine Mammal Mitigation and Monitoring Plan. A minimum of one observer would be placed at a vantage point providing total coverage of the monitoring zones and for observation zones larger than 500 m, at least one other additional observer will be placed at the outermost float or other similar vantage point in order to observe the extend observation zone. Optimal observation locations will be selected based on visibility and the type of work occurring. All PSOs would be trained in marine mammal identification and behaviors and are required to have no other project-related tasks while conducting monitoring. In addition, 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. Monitoring of construction activities msut be conducted by qualified PSOs (see below), who must have no other assigned tasks during monitoring periods. The applicant must adhere to the following conditions when selecting observers:

- Independent PSOs must be used (*i.e.*, not construction personnel).
- At least one PSO must have prior experience working as a marine mammal observer during construction activities.
- Other PSOs may substitute education (degree in biological science or related field) or training for experience.
- Where a team of three or more PSOs are required, a lead observer or monitoring coordinator must be designated. The lead observer must have prior experience working as a marine mammal observer during construction.
- The applicant must submit PSO CVs for approval by NMFS.

The applicant must ensure that observers have the following additional qualifications:

- Ability to conduct field observations and collect data according to assigned protocols.
- Experience or training in the field identification of marine mammals, including the identification of behaviors.
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations.
- 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, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior.
- 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.:

A draft marine mammal monitoring report would be submitted to NMFS within 90 days after the completion of construction activities. It will include an overall description of work completed, a narrative regarding marine mammal sightings, and associated PSO data sheets. Specifically, the report must include:

- 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 construction activity;
- Distance from construction 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.

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 addressing NMFS comments 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 a serious injury or mortality, The City of Juneau would immediately cease the specified activities and report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator. The report would include the following information:

- Description of the incident;
- Environmental conditions (*e.g.*, Beaufort sea state, visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

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

In the event that The City of Juneau discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (*e.g.*, in less than a moderate state of decomposition as described in the next paragraph), the City of Juneau would immediately report the incident to the Office of Protected Resources, NMFS, and the Alaska 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 City of Juneau to determine whether modifications in the activities are appropriate.

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

Negligible Impact Analysis and Determination

NMFS has defined negligible impact 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 (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be “taken” through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS’s implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

As stated in the proposed mitigation section, shutdown zones equal to or exceeding Level A isopleths shown in Table 7 for all activities other than blasting will be implemented. Serious injury or mortality is not anticipated nor authorized. Behavioral responses of marine mammals to pile removal and dredging, if any, are expected to be mild and temporary due to the short term duration of the noise produced by the source as well as the relatively low source levels when compared with ambient levels in an area with high levels of anthropogenic activity. Given the short duration of noise-generating activities per day and that pile removal and dredging would occur for 55 days, any harassment would be temporary. The blasting is only proposed to occur across 2 days, with one blast scheduled on each day. In addition, the project includes generally low level sound sources, such as dredging and removal of piles much smaller than those frequently used in other construction projects. In addition, for all species except humpbacks, there are no known biologically important areas near the project zone that would be impacted by the construction activities. The region of Statter Harbor where the project will take place is located in a developed harbor area with regular marine vessel traffic. Although there is a resident harbor seal population, the area proposed for construction is not known to be of important biological significance such as used for breeding or foraging. In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No mortality is anticipated or authorized;
- There are no known biologically important areas within the project area;
- The City of Juneau would implement mitigation measures such as shut down zones for all in-water and over-water activities;

- Monitoring reports from similar work in Alaska have documented little to no effect on individuals of the same species impacted by the specified activities;

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 proposed activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under Sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

Table 8 below shows take as a percent of population for each of the species listed above.

Table 8. Summary of the estimated numbers of marine mammals potentially exposed to Level A and Level B sound levels.

Species	DPS/Stock	Proposed Number of Level B Takes by Stock	Proposed Number of Level A Takes by Stock	Stock Abundance	Percent of Population[1]
Steller sea lion	Eastern DPS Western DPS	3,930 80	20 0	41,638 53,303	9.5 0.15
Harbor seal	Lynn Canal	1,794	22	9,478	19
Harbor porpoise	Southeast Alaska	68	4	975	6.67

Humpback whale	Central North Pacific Stock	24	0	10,103	0.24
Total		**5,897**	**46**	**N/A**	**N/A**

Table 8 presents the number of animals that could be exposed to received noise levels that may result in Level A or Level B take for the proposed work at Statter Harbor. Our analysis shows that less than one third of the best available population estimate of each affected stock could be taken. Therefore, the numbers of animals authorized to be taken for all species would be considered small relative to the relevant stocks or populations even if each estimated taking occurred to a new individual—an extremely unlikely scenario. For pinnipeds, especially harbor seals and Steller sea lions, occurring in the vicinity of the project site, 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.

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

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. The proposed project is not known to occur in an important subsistence hunting area. It is a developed area with regular marine vessel traffic and the project is one year of a multi-year harbor improvement effort that is already underway. The work at this harbor has been publicized and public input has been solicited on the overall improvement.

Based on the description of the specified activity, the measures described to minimize adverse effects on the availability of marine mammals for subsistence purposes, and the proposed mitigation and monitoring measures, NMFS has preliminarily determined that there will not be an unmitigable adverse impact on subsistence uses from the City of Juneau's proposed activities.

Endangered Species Act (ESA)

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

NMFS is proposing to authorize take of western DPS Steller sea lions and potentially Mexico DPS humpback whales, which are listed under the ESA. We have requested initiation of Section 7 consultation for the issuance of this IHA. NMFS will conclude the ESA consultation prior to reaching a determination regarding the proposed issuance of the authorization.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to the City of Juneau for conducting harbor improvement activities in Statter Harbor, Alaska, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. This section contains a draft of the IHA itself. The wording contained in this section is proposed for inclusion in the IHA (if issued).

1. This Incidental Harassment Authorization (IHA) is valid from January 1, 2019 to December 31, 2019.

2. This IHA is valid only for in-water construction activities associated with improvements in Statter Harbor, Alaska.

3. General Conditions

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

(b) The species authorized for taking are humpback whale (*Megaptera novaeangliae*), harbor porpoise (*Phocoena phocoena*), Steller sea lion (*Eumetopias jubatus*), and harbor seal (*Phoca vitulina*).

(c) The taking, by Level A and Level B harassment, is limited to the species listed in condition 3(b). See Table 9 for numbers of take authorized.

(d) For those marine mammals for which take has not been requested, in-water activities must shut down immediately when the animals are sighted.

(e) The taking by serious injury or death of any species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA.

(f) The City of Juneau must conduct briefings between construction supervisors and crews, marine mammal monitoring team, and the City of Juneau staff prior to the start construction activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

(g) Work may only occur during daylight hours.

4. Mitigation Measures

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

(a) Shutdown Measures.

(i) The City of Juneau must implement shutdown measures if the number of any allotted marine mammal takes reaches the limit under the IHA and if such marine mammals are sighted within the vicinity of the project area and are approaching their respective Level A or Level B monitoring zone.

(ii) If a marine mammal comes within 10 meters of in-water, heavy machinery work, operations must cease and vessels must reduce speed to the minimum level required to maintain steerage and safe working conditions. Construction crew members can enforce this shutdown zone.

(b) The City of Juneau must establish Level A and Level B monitoring zones as shown in Table 10.

(c) The City of Juneau must monitor the zone for 30 minutes prior to blasting to establish that the monitoring zone is clear of marine mammals as long as practicable. Blasting-related activity must be conducted in daylight hours.

5. Monitoring

The holder of this Authorization is required to conduct marine mammal monitoring during construction activities. Monitoring and reporting must be conducted in accordance with the Monitoring Plan.

(a) Pre-Activity Monitoring

(i) Prior to the start of daily in-water construction activity, or whenever a break in construction activity of 30 minutes or longer occurs, the observer(s) must observe the shutdown and monitoring zones for a period of 30 minutes.

(ii) The shutdown zone must be cleared when a marine mammal has not been observed within that zone for that 30-minute period.

(iii) If a marine mammal is observed within the shutdown zone, activities can proceed if the animal is observed leaving the zone or has not been observed for 30 minutes, even if visibility of Level B zone is impaired.

(iv) If the Level B harassment zone has been observed for 30 minutes and species for which take is not authorized are not present within the zone, in-water construction can commence and work can continue even if visibility becomes impaired within the Level B zone.

(v) When a marine mammal permitted for Level B take is present in the Level B harassment zone, pile removal and dredging activities may begin and or continue and Level B take must be recorded.

(vi) If the entire Level B zone is not visible while work continues, exposures must be recorded and extrapolated based upon the amount of total observed exposures and the percentage of the Level B zone that was not visible.

(b) Monitoring must be conducted by qualified protected species observers (PSOs), with minimum qualifications as described previously in the *Monitoring and Reporting* section.

(i) Two observers must be on site to actively observe the shutdown and monitoring zones during all pile removal and dredging.

(ii) Observers must use their naked eye with the aid of binoculars, and/or a spotting scope during all construction activities.

(iii) Monitoring location(s) must be identified with the following characteristics:

1. Unobstructed view of activity being conducted;

2. Unobstructed view of all water within the Level A zone (if applicable) and as much of the Level B harassment zone as possible.

(c) If environmental conditions restrict the PSOs ability to observe within the marine mammal shutdown zone (*e.g*., excessive wind or fog), construction activities must cease. Work must not be initiated until the entire shutdown zone is visible.

(d) Marine mammal location must be determined using a rangefinder and a GPS or compass.

(e) Ongoing in-water work may be continued during periods when conditions such as low light, darkness, high sea state, fog, ice, rain, glare, or other conditions prevent effective marine mammal monitoring of the entire Level B harassment zone. PSOs would continue to monitor the visible portion of the Level B harassment zone throughout the duration of construction activities.

(f) Post-activity monitoring must be conducted for 30 minutes beyond the cessation of construction activities at end of day.

6. Reporting

The holder of this Authorization is required to:

(a) Submit a draft report on all monitoring conducted under the IHA within ninety calendar days of the completion of marine mammal monitoring This report must detail the monitoring protocol, summarize the data recorded during monitoring, and estimate the number of marine mammals that may have been harassed, including the total number extrapolated from observed animals across the entirety of relevant monitoring zones A final report must be prepared and submitted within thirty days following resolution of comments on the draft report from NMFS. This report must contain the following:

(i) Date and time a monitored activity begins or ends;

(ii) Construction activities occurring during each observation period;

(iii) Record of implementation of shutdowns, including the distance of animals to the activity and description of specific actions that ensued and resulting behavior of the animal, if any;

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

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

(vi) Species, numbers, and, if possible, sex and age class of marine mammals;

(vii) Description of any observable marine mammal behavior patterns;

(viii) Distance from construction activities to marine mammals and distance from the marine mammals to the observation point;

(ix) Locations of all marine mammal observations; and

(x) Other human activity in the area;

(b) Reporting injured or dead marine mammals:

(i) In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as a serious injury or mortality, The City of Juneau must immediately cease the specified activities and report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, NMFS. The report must include the following information:

1. Time and date of the incident;

2. Description of the incident;

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

4. Description of all marine mammal observations and active sound source use in the 24 hours preceding the incident;

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

6. Fate of the animal(s); and

7. Photographs or video footage of the animal(s). Activities must not resume until NMFS is able to review the circumstances of the prohibited take. NMFS must work with the City of Juneau to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. The City of Juneau may not resume their activities until notified by NMFS.

(ii) In the event that the City of Juneau discovers an injured or dead marine mammal, and the lead observer determines that the cause of the injury or death is unknown and the death is relatively recent (*e.g.*, in less than a moderate state of decomposition), the City of Juneau must immediately report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, NMFS. The report must include the same information identified in 6(b)(i) of this IHA. Activities may continue while NMFS reviews the circumstances of the incident. NMFS must work with the City of Juneau to determine whether additional mitigation measures or modifications to the activities are appropriate.

(iii) In the event that the City of Juneau discovers an injured or dead marine mammal, and the lead observer determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), the City of Juneau must report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, NMFS, within 24 hours of the discovery. The City of Juneau must provide photographs, video footage, or other documentation of the stranded animal sighting to NMFS.

7. Authorization

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

Table 9. Authorized take numbers, by species/stocks.

Species	DPS/Stock	Level A Takes	Level B Takes
Steller sea lion	Eastern DPS Western DPS	20 0	3,930 80
Harbor seal	Lynn Canal	22	1,794
Harbor porpoise	Southeast Alaska	4	68
Humpback whale	Hawaii DPS/Central North Pacific Stock	0	24
Total		**46**	5,897

Table 10. Monitoring Zones in Meters (m).

	Monitoring Zones				Shutdown Zones
Source	High Frequency Cetacean	Low Frequency Ceteacean	Phocid	Otariid	All species
Vibratory Removal – Steel	1,820 m	1,820 m	1,820 m	1,820 m	10 m
Vibratory Removal – Timber	1,360 m	1,360 m	1,360 m	1,360 m	10 m
Dredging	110 m	110 m	110 m	110 m	10 m
Blasting (PTS)	160 m	180 m	80 m	10 m	10 m
Blasting (TTS)	340 m	990 m	410 m	60 m	10 m

Request for Public Comments

We request comment on our analyses, the proposed authorization, and any other aspect of this Notice of Proposed IHA for the proposed harbor improvement activities. We also request comment on the potential for renewal of this proposed IHA as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform our final decision on the request for MMPA authorization.

On a case-by-case basis, NMFS may issue a second one-year IHA without additional notice when (1) another year of identical or nearly identical activities as described in the Specified Activities section is planned or (2) the activities would not be completed by the time the IHA expires and a second IHA would allow for completion of the activities beyond that described in the Dates and Duration section, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to expiration of the current IHA;

- The request for renewal must include the following:

(1) An explanation that the activities to be conducted beyond the initial dates either are identical to the previously analyzed activities or include changes so minor (*e.g.*, reduction in pile size) that the changes do not affect the previous analyses, take estimates, or mitigation and monitoring requirements; and

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized; and

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

Dated: October 11, 2018.

Donna S. Wieting,

Director,

Office of Protected Resources,

National Marine Fisheries Service.

[FR Doc. 2018-22604 Filed: 10/16/2018 8:45 am; Publication Date: 10/17/2018]