DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648–XA210]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Construction of the Alaska LNG Project in Prudhoe Bay, 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 Alaska Gasline Development Corporation (AGDC) for authorization to take marine mammals incidental to construction of the Alaska LNG Project in Prudhoe Bay, 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 August 17, 2020.

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Written comments should be sent to *ITP.Davis@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/permit/incidental-take-authorizations-under-marine-mammal-protection-act* without change. All personal identifying information (*e.g.,* name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Leah Davis, 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/permit/incidental-take-authorizations-under-marine-mammal-protection-act.* 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 the 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 the takings are set forth.

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 incidental harassment authorization) with respect to potential impacts on the human environment. Accordingly, NMFS plans to adopt the Federal Energy Regulatory Commission's (FERC) EIS, provided our independent evaluation of the document finds that it includes adequate information analyzing the effects on the human environment of issuing the IHA. NMFS is a cooperating agency on FERC's EIS.

The FERC's EIS was made available for public comment from June 28, 2019 to October 3, 2019. The FERC's Final EIS is available at *https://www.ferc.gov/industries/gas/enviro/eis/2020/03-06-20-FEIS.asp.*

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 March 28, 2019, NMFS received a request from AGDC for an IHA to take marine mammals incidental to construction activities in Prudhoe Bay, Alaska. AGDC submitted revised applications on May 29, 2019; September 16, 2019; October 31, 2019, February 7, 2020; and February 25, 2020. The application was deemed adequate and complete on May 21, 2020. AGDC's request is for take of a small number of six species of marine mammals by harassment. Neither AGDC nor NMFS expects serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

This proposed IHA would authorize incidental take during one year of the larger AK LNG project for which AGDC has also requested a five-year Letter of Authorization (LOA) (84 FR 30991, June 28, 2019) for incidental take associated with project activities in Cook Inlet, Alaska. The larger project involves a pipeline that will span approximately 807 miles (mi) (1,290 kilometers [km]) from a gas treatment facility on Alaska's North Slope, which holds 35 trillion cubic feet (ft^3) of proven gas reserves, to a liquefaction and export facility in southcentral Alaska.

Description of Proposed Activity

Overview

AGDC plans to construct an integrated liquefied natural gas (LNG) project with interdependent facilities to liquefy supplies of natural gas from Alaska, in particular from the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU)

production fields on the Alaska North Slope (North Slope), for export in foreign commerce and for in-state deliveries of natural gas. AGDC plans to construct an Alaska LNG Gas Treatment Plant (GTP), which they would construct with large, pre-fabricated modules that that can only be transported to the North Slope with barges (sealifts).

AGDC is proposing to modify the existing West Dock causeway and associated dock heads in Prudhoe Bay, Alaska in order to facilitate offloading modular construction components and transporting them to the GTP construction site. Vibratory and impact pile driving associated with the work at West Dock would introduce underwater sound that may result in take by Level A and Level B harassment of marine mammals in Prudhoe Bay, Alaska. AGDC proposes to conduct pile driving up to 24 hours per day on approximately 123 days from July through October during the open water (*i.e.,* ice-free) season.

Dates and Duration

The proposed IHA would be effective from July 1, 2022 to June 30, 2023. Work that may result in the take of marine mammals is expected to take place during the open water season, between July and October, and would be conducted up to 24 hours per day, six days per week.

Several communities on the North Slope of Alaska engage in subsistence hunting activities at varying times and in varying locations. These subsistence hunts are further described below in the Effects of Specified Activities on Subsistence Uses of Marine Mammals section. The proposed construction activities would occur closest to the marine subsistence use area used by the Native Village of Nuiqsut, which typically occurs August 25th to September 15th, or earlier if whaling is complete. AGDC will cease pile driving during the Nuiqsut whaling season.

AGDC conservatively calculated that in-water construction would last 164 days. However, they expect that different pile types would be installed on the same day, which was not accounted for in the 164-day estimate. Therefore, given the information AGDC has provided NMFS, we expect that construction will require approximately 123 days of in-water work considering the open water period, and the break in construction during the whaling season. If AGDC is not able to complete the work during the open water season construction period as planned, they will complete the work during a contingency period from late February to April 2023.

Specific Geographic Region

The AK LNG construction activities at issue in this IHA will occur at West Dock in Prudhoe Bay, Alaska, on Alaska's North Slope. West Dock is a multipurpose facility, commonly used to offload marine cargo to support Prudhoe Bay oilfield development. West Dock extends out from the shoreline 2.7 miles (mi) (4.3 kilometers [km]) and is within shallow waters less than 14.2 feet (ft.) (4.3 meters [m]) deep. Please see Figure 1 in AGDC's application for a map of the West Dock area.

Detailed Description of Specific Activity

Below, we discuss the proposed activities in Prudhoe Bay, a portion of the larger AK LNG project (which extends from the North Slope to Cook Inlet). For information on other AK LNG project components, please refer to Volume I, Chapter 2 of the Alaska LNG Final EIS.

AGDC is proposing to further develop the West Dock facility in Prudhoe Bay, AK. West Dock is a multipurpose facility, commonly used to offload marine cargo to support Prudhoe Bay oilfield development. The West Dock causeway, which extends approximately 2.5 mi (4 km) into Prudhoe Bay from the shoreline, is a solid-fill gravel causeway structure. There are two existing loading docks along the causeway, referred to as Dock Head 2 (DH2) and Dock Head 3 (DH3), and a seawater treatment plant (STP) at the seaward terminus of the structure. A 650-ft (198-m) breach with a single lane bridge was installed in the causeway between DH2 and DH3 during 1995 and 1996 due to concerns that the solid causeway was affecting coastal circulation and marine resources.

Development of the dock facility would require constructing a new dock head referred to as Dock Head 4 (DH4), widening the gravel causeway between the proposed DH4 site and the onshore road system, and installation of a temporary barge bridge parallel to the existing bridge over the aforementioned breach to accommodate transport of the modules over the breach. The following describes these activities in detail.

Causeway Widening—AGDC will build a parallel causeway approximately 100–125 ft (30.5–38.1 m) wide and 5,000 ft. long (1,524 m) on the east side of the existing causeway from DH3 to DH4. AGDC will upgrade the other two existing segments of West Dock causeway to a width of approximately 100–125 ft (30.5–38.1 m) from the current width of 40–80 ft. (12.2–24.4 m). AGDC will conduct the widening on the east side of the causeway because there is a pipeline along the west side. The widening would occur along approximately 4,500 ft. (1,372 m) from DH3 to DH2, and 3,800 ft. (1,158 m) from DH2 to land. This causeway widening work would be conducted during the summer (July–August). Gravel would be hauled in by truck and deposited in place by shore-based heavy equipment. Expected gravel requirements are indicated in Table 2 of AGDC's application. NMFS does not expect gravel deposition to result in take, and therefore, we do not discuss it further in this notice.

DH4 Work Area and Bulkhead—AGDC will construct a new dock head (DH4). DH4 would be a gravity-based structure, with a combi-wall (sheet piles connected by H-piles) bulkhead or dock face back-filled with gravel. The gravel dock head would provide a working area of approximately 31 acres (0.13 km^2) and would have five cargo berths. Gravel would be hauled in by truck and deposited in place by shore-based heavy equipment. Hauling and placement of gravel for construction of DH4 would occur from June–September. Gravel requirements are quantified in Table 3 of AGDC's application.

Construction of DH4 would require the installation of over 1,080 linear ft. (329 m) of combi-wall forming a bulkhead at the dock face, and will require vibratory and impact pile driving. Other margins of the dock head would be sloped and armored with sand bags. Table 1 indicates the planned numbers and types of piles proposed for installation, and proposed installation method for DH4 work, including the work area and bulkhead.

TABLE 1—PILES PLANNED FOR INSTALLATION AT DH4

Pile type/size	Installation method	Number of piles
11.5-inch Steel H-Pile	Impact	212
48-inch Steel Pipe Pile	Impact	12

TABLE 1—PILES PLANNED FOR INSTALLATION AT DH4—Continued

Pile type/size	Installation method	Number of piles
25-inch Steel Sheet Pile	Vibratory	422
14-inch Steel H-Pile (temporary)	Vibratory	48

AGDC plans to construct DH4 from June–October (open water season). Hauling and placing of the gravel will take place first. AGDC plans to install the combi-wall mid-September–October (after the whaling season and before ice). If AGDC is not able to complete the DH4 construction during the open water season, they plan to complete construction during a contingency period from February to April 2023, working off the ice.

DH4 Mooring Dolphins—AGDC plans to install twelve mooring dolphins in the cargo berths at the proposed DH4 to hold the ballasted barges in place. Figure 5 of AGDC's application shows the locations of the proposed mooring dolphins. AGDC plans to install four temporary spuds (14-inch steel H piles) for support prior to the construction of each mooring dolphin using a vibratory hammer. AGDC would extract these piles immediately after completion of the dolphin. Table 1 lists the proposed pile types, numbers, and driving methods for DH4 work, including the mooring dolphins.

AGDC plans to install the mooring dolphins from September–October (after the Nuiqsut whaling season and before ice cover). If AGDC is not able to complete mooring dolphin construction during this time, they plan to complete construction during a contingency period from late February to April of the following year.

Berthing Basin—The proposed location of the DH4 bulkhead is approximately 1,000 ft. (305 m) beyond the end of the existing causeway at the STP. This location was selected as it provides an existing nominal water depth of −12 ft. (−3.7 m) mean lower low water (MLLW) across the length of the bulkhead, allowing for berthing of cargo barges at their intended transit draft of 10 ft. (3.05 m) without the exchange of ballast water.

AGDC plans to conduct screeding over the seafloor within the berthing area to a depth of −12 ft. (−3.7 m) MLLW. Screeding would redistribute the seabed materials to provide a flat and even surface on which the module cargo barges can be grounded. The berthing area encompasses approximately 13.7 acres (0.06 km^2). In the screeding process, a tug and/or barge pushes or drags a beam or blade across the seafloor, removing high spots and filling local depressions. The screeding operation is not intended to increase or decrease overall seabed elevation so there would be no excavated materials requiring disposal.

AGDC would conduct screeding in the summer immediately prior to arrival of each sealift and as soon as sea ice conditions allow mobilization of the screeding barge. Based on historical ice data, AGDC anticipates screeding during July for a period of up to 14 days. AGDC would conduct a multi-beam hydrographic survey to identify high and low spots in the seabed prior to each season with equipment emitting sound at frequencies above 200 kilohertz (kHz). We do not expect the survey to result in take, and we do not discuss it further in this notice. Additionally, we do not expect screeding to result in take of marine mammals, given that it is a continuous noise source comparable to other general construction activities. The Biological Opinion issued by NMFS' Alaska Regional Office conservatively requires AGDC to shut down at 215 m during screeding operations. AGDC has not requested, and NMFS does not propose to authorize take incidental to the proposed screeding.

Barge Bridge—The existing bridge over the aforementioned 650 ft. (198 m) breach in the causeway is too narrow for module transport and incapable of supporting the weight of the project modules. Therefore, AGDC plans to construct a temporary barge bridge to accommodate transport of the modules over the breach and to the onshore road system. AGDC plans to construct new sheet pile and gravel abutments along the east side of the existing bridge and plans to install four mooring dolphins. Two barges would then be placed along these mooring dolphins and between the abutments to form a temporary bridge for module transport.

Sealifts and barge bridge installation and removal (not including pile driving) would occur each of six consecutive years to accommodate the modules required for the project. AGDC would construct the approach abutments and mooring dolphins (each further described below) in the first season, and would prepare the seabed before installation of the barge bridge for the first sealift. The barge bridge would be installed annually each sealift year at the beginning of the open-water season, and would be removed each fall prior to freeze-up. This installation and removal does not include installation and removal of the mooring dolphins. AGDC expects to conduct some seabed preparation prior to installation and use of the barge bridge in each subsequent sealift year. NMFS does not expect annual placement, use, or removal of the barge bridge or the seabed preparation to result in marine mammal harassment, and therefore we do not discuss it further in this notice.

Barge Bridge Abutments—AGDC plans to construct approach abutments (gravel filled open-cell sheet pile bulkheads) along the east side of the existing causeway on both ends of the barge bridge. AGDC would place gravel bags for erosion control in locations where there is no bulkhead. The bulkheads would be approximately 420 ft. (128 m) long (along the causeway) and 120 ft. (36.6 m) across.

Much of the abutment sheet pile is for the tail walls that run from the bulkhead into the gravel fill and terminate at an anchor pile (H-pile). A large portion of this tail wall piling and many of the tail wall anchor piles would be driven into dry ground and are not included in the analysis for assessing in-water noise impacts on marine mammals. Table 2 lists the numbers and types of pilings planned for in-water installation for the barge bridge abutments.

TABLE 2—PILES PLANNED FOR IN-WATER INSTALLATION AT THE NORTH AND SOUTH BARGE BRIDGE ABUTMENT BULKHEADS

	Pile type and installation method	Number of piles
South Abutment	19.69-inch Steel Sheet Pile (Vibratory)	695
	14-inch Steel H-Pile (Impact)	4
North Abutment	19.69-inch Steel Sheet Pile (Vibratory)	609
	14-inch Steel H-Pile (Impact)	4

AGDC plans to install the sheet piles from land or barges on open water, and potentially from the ice if the contingency period is necessary.

Construction of the barge bridge abutments is scheduled for July–August with a break in pile driving during the Nuiqsut whaling season (approximately August 25–September 15) if activities overlap. If AGDC is unable to complete construction during the open water period, they plan to complete the work during the contingency period from February to April of 2023.

Barge Bridge Mooring Dolphins—AGDC plans to install four mooring dolphins at the barge bridge site to protect the current bridge from the barges and hold the ballasted barges in place. Each mooring dolphin consists of one 48-inch diameter (1.2 m), 100 ft. (30.5 m) long steel pipe pile that AGDC will drive with an impact hammer to a minimum of 65 ft. (19.8 m) into the seabed. As described above for the DH4 mooring dolphins, AGDC plans to install four temporary spuds (14.5-inch steel H-piles) with a vibratory hammer for support prior to the construction of each barge bridge mooring dolphin. AGDC would extract these temporary spuds immediately after completion of the dolphin.

AGDC plans to construct the barge bridge abutments, including the mooring dolphins, in July and August, with a break in pile driving during the Nuiqsut whaling season (approximately August 25–September 15). If AGDC is not able to complete the work during that period, they will complete the dolphin installation during the contingency period from February to April of 2023.

TABLE 3—PILES PLANNED FOR MOORING DOLPHIN INSTALLATION AT THE BARGE BRIDGE ABUTMENTS

Pile type	Installation method	Number of piles
48-inch Steel Pipe Pile	Impact	4
14-inch Steel H-Pile (Temporary)	Vibratory	[a] 16

[a] Each of these piles will be installed and later removed after installation of mooring dolphin.

TABLE 4—TOTAL NUMBER OF PILES AMONG ALL PRUDHOE BAY PROJECT COMPONENTS

Pile size and type	Hammer type	Number of piles
11.5-inch H-Pile	Impact	212
14.5-inch H-Pile	Impact	8
	Vibratory	64
48-inch Pipe Pile	Impact	16
Sheet Piles (19.69-inch and 25-inch)	Vibratory	1,726

AGDC will only operate one hammer at a time during all pile driving.

Seabed Preparation at the Barge Bridge—AGDC will construct a level and stable barge pad to support the ballasted barge at the proper horizontal and vertical location for successful transit of modules across the breach. The pad would be designed to support the fully loaded weight of the barge and the heaviest modules.

Pad construction would include an initial through-ice bathymetric survey within the breach. AGDC would conduct the through-ice survey by drilling or augering holes through the ice and measuring the bottom elevations by a survey rod tied to the local Global Positioning System—Real Time Kinematic (GPS–RTK) system to provide the needed level of accuracy of horizontal positions and vertical elevations. A grid of survey holes would be established over the 710 ft. (216 m) by 160 ft. (48.8 m) dimensions (2.6 acres; 0.01 km^2) of the breach barge pad to allow for determination of the bottom bathymetry such that a plan can be developed accordingly to prepare the barge pad surface. NMFS expects drilling and augering holes to produce continuous noise similar to other standard construction noise. We do not expect drilling or augering holes to result in take of marine mammals and drilling and auguring holes through the sea ice is not discussed further.

Seabed preparation would consist of smoothing the seabed within the pad area as necessary to level the seabed across the pad at an elevation grade of approximately −7 ft. (−2.1 m) MLLW. Some gravel fill may be required at scour holes. Rock filled marine mattresses or gabions approximately 1 ft. (0.3 m) thick would then be placed across the graded pad to provide a stable and low maintenance surface at −6 ft. (− 1.8 m) MLLW on which the barges would be grounded. These mattresses are gravel-filled containers constructed of high-strength geogrid, with the geogrid panels laced together to form mattress-shaped baskets.

AGDC would conduct the seabed preparations through the ice during winter using excavation equipment and ice excavation methods. Equipment required for the grading work includes ice trenchers, excavators, front-end

loaders, man-lifts, haul trucks, survey equipment, and other ancillary equipment necessary to support the operation. An equipment spread includes a trencher for cutting ice, an excavator for removing ice, a second excavator, and haul units. AGDC would initiate through-ice grading efforts by cutting through the ice with trenchers. Excavators would then proceed to remove the ice to expose the seafloor bottom. Once a section has been exposed to the seafloor, the bottom will be graded to −7 ft. (−2.1 m) MLLW using the excavation equipment. AGDC would then install marine mattresses on the graded pad, likely requiring use of a crane. Grounded ice conditions are expected to occur at the breach on or before February 1st of each year at the latest. AGDC expects to conduct through-ice surveying and grading work immediately after, if not sooner. AGDC expects the total construction duration will be 45 to 60 days with construction complete by the end of March and demobilization from the breach area in early April. NMFS expects these activities to produce continuous noise similar to other standard construction noise. Ringed seals could be present during this time, particularly in subnivean lairs (Frost and Burns, 1989; Kelly *et al.,* 1986; Williams *et al.,* 2001). It is likely that few, if any, spotted or bearded seals would be present during that time (Bengston *et al.,* 2005; Lowry *et al.,* 1998; Simpkins *et al.,* 2003). Additionally, we do not expect cetaceans to be present in the area during this time (Quakenbush *et al.,* 2018, Citta *et al.,* 2016). We do not expect these seabed preparation activities to result in take of marine mammals and do not discuss them further.

AGDC may conduct some screeding right before the barges are placed in summer in an effort to achieve a surface that is near flush with adjacent subsurface elevations. Any screeding at the barge bridge site would be expected to take 14 days or less. As discussed previously, NMFS does not expect screeding to result in marine mammal harassment, therefore, screeding is not discussed further in this document.

Barge Bridge Installation—The first two barges to offload materials would be used to form the temporary bridge, paralleling the existing weight-limited bridge, and spanning the breach. AGDC would move these barges into place against the mooring dolphins with tugs where they would be ballasted and fastened to the causeway abutments and each other. The two ballasted barges would be placed bow-to-bow when resting on the seafloor. The barge rakes would angle upward and touch at their adjoining point, leaving an approximately 52.5-ft (16-m) gap at the seafloor between the barges. The stern of each barge would angle sharply upward at each end of the bridge, leaving an additional 10-ft (3.1-m) gap at the seafloor at each end.

Ramps would be installed to accommodate smooth transit of the self-propelled module transporters (SPMTs) over the bridge. Modules would be transported by SPMTs down the causeway and over the temporary bridge to a staging pad at the base of West Dock. From there, they would be moved southward over approximately 6 mi (9.7 km) of new and existing roads to the GTP construction site.

AGDC expects construction of the temporary barge bridge will last 3 days. The temporary bridge would be held in place by the mooring dolphins. AGDC expects the temporary bridge to be in place for 21 to 39 days, depending on weather conditions and logistics. At the conclusion of each year's sealift, AGDC would de-ballast the barges and remove them from the breach. Upon the subsequent summer season and the next sealift, AGDC would position the barges back in the breach and re-ballast them onto the barge pad for module transport operations. NMFS does not expect placement or removal of the barge bridges to result in take of marine mammals, and we do not discuss it further.

AGDC plans to leave West Dock modifications in place after modules are offloaded, as their removal would result in greater disturbance to the surrounding environment. AGDC also plans to leave the piling and infrastructure forming the offshoot and ramp to the temporary barge bridge in place, as removing it may result in erosion or weakening of the existing causeway. AGDC would cut the mooring pilings below the sediment surface, remove them, and cover the area with surrounding sediment.

Sealifts—AGDC has proposed six sealifts, consisting of two preliminary sealifts (NEG1 and NEG2) transporting materials (smaller modules, equipment, and supplies) and four primary sealifts (Sealifts 1–4) carrying the GTP modules. AGDC identified the timing, numbers of vessels, and numbers of modules associated with each of these six sealifts in their application (See Tables 8 and 9 of AGDC's application).

The barges will transport the modules from the manufacturing site (likely in Asia) with first call being Dutch Harbor to clear customs. The barges would then proceed to a designated Marine Transit Staging Area (MTSA), with Port Clarence being the preferred location for the MTSA at this time. The tug and barge will wait in a secure anchorage there until sea ice conditions have improved to 3/10 ice cover or better. The tow spread would be accompanied by a light aircraft which would repeatedly fly along the tow route to give a detailed report on sea and ice conditions. When such conditions are favorable, the tug and barge would proceed to the Prudhoe Bay Offshore Staging Area (PBOSA) located south (shoreward) of Reindeer Island and approximately 5 mi (8 km) north of DH4 to await berthing at DH4.

The sealift barges would be moved from the PBOSA to DH4 with the shallow draft assist tugs. Offloading operations at DH4 would occur 24 hours a day during periods of favorable metocean and weather conditions. Current North Slope sealift practices limit operations to wind speed below 20 knots. The barges would be butted up against the dock face and then ballasted down until they rest on the prepared barge bearing pad. Ramps would be placed to connect the barge deck with the dock so that the SPMTs are able to roll under the modules, lift them, then roll out and transport them to the onshore module staging area.

The barges would be demobilized from the PBOSA by ocean-going tugs using standard marine shipping routes. The barges would transit individually through the Beaufort and Chukchi seas rather than in groups, as occurred during their arrival into Prudhoe Bay. They would be demobilized from Prudhoe Bay on or about mid-September. NMFS does not expect take to occur associated with ordinary vessel transit, and therefore the use of sealifts is not discussed further.

NMFS is carrying forward impact and vibratory pile driving and removal (piles indicated in Table 4) for further analysis regarding potential take of marine mammals. Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see Proposed Mitigation and Proposed Monitoring and Reporting).

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of 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 (SARs; *https://www.fisheries.noaa.gov/national/*

marine-mammal-protection/marine-mammal-stock-assessments) and more general information about these species (*e.g.,* physical and behavioral descriptions) may be found on NMFS's website (*https://www.fisheries.noaa.gov/find-species*). Additional information may be found in the Aerial Survey of Arctic Marine Mammals (ASAMM) reports, which are available online at *https://www.fisheries.noaa.gov/alaska/marine-mammal-protection/aerial-surveys-arctic-marine-mammals.*

Table 5 lists all species or stocks for which take is expected and proposed to be authorized for this action, 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 (2019). 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' 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. Pacific and Alaska SARs (*e.g.,* Muto *et al.,* 2019). All values presented in Table 5 are the most recent available at the time of publication and are available in the 2018 Pacific and Alaska SARs (Carretta *et al.,* 2019; Muto *et al.,* 2019) and draft 2019 Alaska SARs (available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports*).

TABLE 5—SPECIES FOR WHICH TAKE IS REASONABLY LIKELY TO OCCUR

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 Eschrichtiidae:						
Gray whale	*Eschrichtius robustus*	Eastern North Pacific	-/-; N	26,960 (0.05, 25,849, 2016)	801	139
Family Balaenidae:						
Bowhead whale	*Balaena mysticetus*	Western Arctic	E/D; Y	16,820 (0.052, 16,100, 2011)	161	53
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae:						
Beluga whale	*Delphinapterus leucas*	Beaufort Sea	-/-; N	39,258 (0.229, NA, 1992)	UND	139
		Eastern Chukchi Sea	-/-; N	20,752 (0.7, 12,194, 2012)	244	67
Order Carnivora—Superfamily Pinnipedia						
Family Phocidae (earless seals):						
Ringed seal	*Phoca (pusa) hispida*	Alaska	T/D; Y	see SAR (see SAR, see SAR, 2013.	5,100	863
Spotted seal	*Phoca largha*	Alaska	-/-; N	461,625 (see SAR, 423,237, 2013).	12,697	329
Bearded seal	*Erignathus barbatus*	Beringia	T/D; Y	see SAR (see SAR, see SAR, 2013.	See SAR	557

[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: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments.* CV is coefficient of variation; Nmin is the minimum estimate of stock abundance.

[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).

As indicated above, all six species (with seven managed stocks) in Table 5 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur, and we have proposed authorizing take. While a harbor porpoise was sighted in the 2017 ASAMM survey (Clarke *et al.,* 2018), the spatial occurrence of harbor porpoise is such that take is not expected to occur, and they are not discussed further beyond the explanation provided here. Harbor porpoise (*Phocoena phocoena*) are considered to be extremely rare in the Beaufort Sea, particularly in the project area (Megan Ferguson, pers. comm., November 2019).

In addition, the polar bear may be found in Prudhoe Bay. However, polar bears are managed by the U.S. Fish and Wildlife Service and are not considered further in this document.

Bowhead Whale

Of the five stocks of bowhead whale, only the Western Arctic stock is found within U.S. waters. This stock is listed as endangered under the ESA and depleted under the MMPA. The stock is classified as a strategic stock and an Alaska Species of Special Concern (Muto *et al.* 2018). From 1978 to 2011, the Western Arctic stock increased at a rate of 3.7 percent (95 percent Confidence Interval [CI] = 2.9–4.6 percent), and abundance tripled from approximately 5,000 to approximately 16,820 whales (Givens *et al.* 2016).

Bowhead whales belonging to the Western Arctic stock are distributed seasonally in ice-covered waters of the Arctic and near-Arctic, generally between 60 degrees and 75 degrees North latitude in the Western Arctic Basin (Moore and Reeves 1993; Muto *et al.* 2018). The majority of the stock migrates annually from wintering areas (December to March) in the central and northwestern Bering Sea, north through the Chukchi Sea in the spring (April through May) following offshore ice leads around the coast of Alaska, and into the eastern Beaufort Sea where they spend most of the summer (June through early to mid-October). Most animals from the stock return to the Bering Sea in the fall (September through December) where they overwinter (Braham *et al.* 1980; Moore and Reeves 1993; Citta *et al.* 2015; Muto *et al.* 2018).

Critical habitat has not been designated for the bowhead whale. NMFS was petitioned in 2000 to consider designating the nearshore areas from Utqiaġvik east to the U.S.–Canada border as critical habitat for the Western Arctic stock. In 2002, NMFS determined that a critical habitat designation was not necessary as the population was increasing and approaching the pre-commercial whaling size, there were no known habitat issues slowing the population growth, and activities that occurred in the petitioned area were already being managed to minimize impacts to the population (67 FR 55767).

The annual migration of the Western Arctic stock to and from the summer feeding grounds in the Beaufort Sea has been monitored by the Bureau of Ocean Energy Management (BOEM) (and predecessor agencies), NMFS, and/or industry since 1982 (Treacy *et al.* 2006; Blackwell *et al.* 2007; Ireland *et al.* 2009; Reiser *et al.* 2011; Bisson *et al.* 2013; Clarke *et al.* 2014). Survey data indicate that the fall migration off northern Alaska occurs primarily over the continental shelf, generally 12–37 mi (19–60 km) offshore, in waters 66–197 ft (11–60 m deep (Moore *et al.* 1989; Moore and Reeves 1993; Treacy 2002; Monnett and Treacy 2005; Treacy *et al.* 2006). Waters less than 15 ft. (4.5 m) deep are considered too shallow to support these whales, and in three decades of aerial surveys by BOEM (ASAMM), no bowhead whale has been recorded in waters less than 16.4 ft (5 m) deep (Clarke and Ferguson 2010).

Monitoring surveys have been conducted annually since 2001 at the Northstar offshore oil and gas facility located just offshore of West Dock. Over 95 percent of the bowheads observed during these fall surveys occurred more than 13.9 mi (22.3 km) offshore in 2001, 14.2 mi (22.9 km) in 2002, 8.4 mi (13.5 km) in 2003, and 10.1 mi (16.3 km) in 2004 (Blackwell *et al.* 2007). West Dock extends out from the shoreline 2.7 mi (4.3 km) and is within shallow waters less than 14.2 ft (4.3 m) deep. The proposed project activities would occur primarily along the West Dock causeway in an area developed for oil and gas with existing vessel traffic. While a small number of bowhead whales have been seen or heard offshore near Prudhoe Bay in late August (LGL and Greenridge 1996; Greene *et al.* 1999; Blackwell *et al.* 2007; Goetz *et al.* 2008), bowheads are not likely to occur in the immediate vicinity of the proposed activities.

Clarke *et al.* (2015) identified nine biologically important areas (BIAs) for bowheads in the U.S. Arctic region. The spring (April–May) migratory corridor BIA for bowheads is far offshore from the behavioral disturbance zones for the project, while the fall (September–October) migratory corridor BIA (western Beaufort Sea on and north of the shelf) for bowheads is further inshore and closer to the project site. Clarke *et al.* (2015) also identified four BIAs for bowheads that are important for reproduction and encompassed areas where the majority of bowhead whales identified as calves were observed each season; none of these reproductive BIAs overlap directly with the behavioral disturbance zones for the AK LNG project. Finally, three bowhead feeding BIAs were identified. Again, there is no spatial overlap of the activity with these BIAs. In summary, we expect that bowhead whales may occur within the project area during the open water season. We would not expect bowheads to be present during AGDC's winter/spring contingency pile driving period.

Gray Whale

The Eastern North Pacific (ENP) stock of gray whales utilize U.S. waters from the southern coast of California north into Alaska. In 1994, the ENP stock was delisted from the ESA due to recovery (59 FR 31094). Punt and Wade (2012) estimated the stock was at 85 percent of carrying capacity and is, therefore, within range of its optimum sustainable population (OSP).

The majority of the ENP stock of gray whales spend the summer and fall feeding in the Chukchi, Beaufort, and northwestern Bering seas before migrating south to the warmer water lagoons of coastal Baja California and Mexico. Prior to 1997, reports of gray whales in the Beaufort Sea were very rare. A single gray whale was killed at Cross Island in 1933 (Maher 1960), and small numbers were observed in the Canadian Beaufort Sea approximately 700 coastal mi (1,100 coastal km) east of Point Barrow in 1980 (Rugh and Fraker 1981). Gray whale sightings became more common from 1998 to 2004, although still infrequent (Miller *et al.* 1999; Treacy 2000; Williams and Coltrane 2002), and, after 2005, the species has been regularly observed in the Beaufort Sea (Green and Negri 2005; Green *et al.* 2007; Jankowski *et al.* 2008; Lyons *et al.* 2009). Feeding gray whales were observed near Elson Lagoon (immediately east of Point Barrow) in 2005 (Green and Negri 2005) and in Smith Bay (approximately 62 mi [100 km] east of Point Barrow) in 2007 (Green *et al.* 2007). Few gray whales have been documented as far east as Cape Halkett (approximately 99 mi [160 km] east of Point Barrow) in the Beaufort Sea, and their occurrence within the project area is not likely.

Clarke *et al.* (2015) identified biologically important areas (BIAs) for gray whale feeding and reproduction in the U.S. Arctic region, however, both are far west of the project area in the Chukchi Sea.

In summary, we expect that gray whales could occur within the project area during the open water season, though occurrence is not likely. We would not expect gray whales to be present during AGDC's winter/spring contingency pile driving period.

Beluga Whale

Of the five stocks of beluga whales occurring in Alaska waters, two inhabit the Beaufort Sea: The Beaufort Sea stock and the Eastern Chukchi Sea stock. Beluga whales from the two stocks migrate between the Bering and Beaufort seas and are closely associated with open leads and polynyas. The Beaufort Sea stock departs the Bering Sea in early spring, migrating through the Chukchi Sea and into the Canadian Beaufort Sea where they spend the summer and most of the fall, returning to the Bering Sea in the late fall. The Eastern Chukchi stock remains in the Bering Sea slightly longer, departing in the late spring and early summer for the Chukchi Sea and western Beaufort Sea where they spend the summer before returning to the Bering Sea in the fall (Muto *et al.* 2018).

O'Corry *et al.* (2018) studied genetic marker sets in 1,647 beluga whales. The data set was from over 20 years and encompassed all of the whales' major coastal summering regions in the Pacific Ocean. The genetic marker analysis of the migrating whales revealed that while both the wintering and

summering areas of the eastern Chukchi Sea and eastern Beaufort Sea subpopulations may overlap, the timing of spring migration differs such that the whales hunted at coastal sites in Chukotka, the Bering Strait (*i.e.,* Diomede), and northwest Alaska (*i.e.,* Point Hope) in the spring and off of Alaska's Beaufort Sea coast in summer were predominantly from the eastern Beaufort Sea population. Earlier genetic investigations and recent telemetry studies show that the spring migration of eastern Beaufort whales occurs earlier and through denser sea ice than eastern Chukchi Sea belugas. The discovery that a few individual whales found at some of these spring locations had a higher likelihood of having eastern Chukchi Sea ancestry or being of mixed-ancestry, indicates that the Bering Strait region is also an area where the stock mix in spring. Citta *et al.* (2016) also observed that tagged eastern Beaufort Sea whales migrated north in the spring through the Bering Strait earlier than the eastern Chukchi belugas, so they had to pass through the latter's primary wintering area. Therefore, the eastern Chukchi stock is unlikely to be present in the action area at any time in general, particularly during summer and fall, when most beluga exposures would be anticipated for this project. However, we conservatively assume that beluga whale takes during AGDC's project could occur to either stock.

Most belugas recorded during aerial surveys conducted in the Alaskan Beaufort Sea in the last two decades were found over 40 mi (65 km) from shore (Miller *et al.* 1999; Funk *et al.* 2008; Christie *et al.* 2010; Clarke and Ferguson 2010; Brandon *et al.* 2011). ASAMM 2016 surveys reported belugas along the continental slope with few sightings nearshore in the western Beaufort Sea, and Clarke *et al.* (2017) reported that distribution was similar to that documented in previous years with light sea ice cover.

Surveys have recorded belugas close to shore and in the vicinity of the activity area. Green and Negri (2005) reported small beluga groups nearshore Cape Lonely (August 26) and in Smith Bay (September 4). Funk *et al.* (2008) reported a group just offshore of the barrier islands near Simpson Lagoon. Aerts *et al.* (2008) reported summer sightings of three groups of eight animals inside the barrier islands near Prudhoe Bay; and Lomac-MacNair (2014) recorded 15 beluga whales offshore of Prudhoe Bay between July and August. While it is possible for belugas to occur in the project area, nearshore sightings are unlikely.

Whales from both the Beaufort Sea and eastern Chukchi Sea stocks overwinter in the Bering Sea. Belugas of the eastern Chukchi may winter in offshore, although relatively shallow, waters of the western Bering Sea (Richard *et al.,* 2001), and the Beaufort Sea stock may winter in more nearshore waters of the northern Bering Sea (R. Suydam, pers. comm. 2012c).

Clarke *et al.,* (2015) identified two biologically important areas (BIAs) for beluga whales in the U.S. Arctic region. Both the spring (April–May) and fall (September–October) migratory corridor BIAs for belugas are far offshore from the behavioral disturbance zones for the project.

In summary, we expect that beluga whales from either the Beaufort Sea or Chukchi Sea stock may occur within the project area during the open water season. We would not expect belugas to be present during AGDC's winter/spring contingency pile driving period.

Ringed Seal

Ringed seals are one of the most common marine mammals in the Beaufort, Chukchi, and Bering Seas, with the Alaska stock estimated at a minimum of 249,000 animals (Allen and Angliss 2011). Ringed seals rely on the sea ice for key life history functions and remain associated with the ice most of the year. They are well adapted to inhabiting both shorefast and pack ice, and diminishing sea ice and snow resulting from climate change is the primary concern for this population. The ice provides a platform for pupping and nursing in late winter and early spring, for molting in late spring to early summer, and for resting during other times of the year. When sea ice is at its maximal extent during the winter and early spring in Alaska waters, ringed seal numbers are high in the northern Bering Sea, and throughout the Chukchi and Beaufort Seas. The species is generally not abundant south of Norton Sound, but animals have occurred as far south as Bristol Bay in years of extensive ice coverage (Muto *et al.* 2018).

Seasonal movements have not been thoroughly documented; however, most ringed seals that overwinter in the Bering and Chukchi seas are thought to migrate north as the ice retreats in the spring. During the summer, ringed seals feed in the pack ice of the northern Chukchi and Beaufort seas, and in nearshore ice remnants of the Beaufort Sea. As the ice advances with freeze-up in the fall, many seals move west and south and disperse throughout the Chukchi and Bering seas while some remain in the Beaufort Sea (Muto *et al.* 2018).

Frost *et al.* (2004) conducted aerial surveys over the Beaufort Sea coast from Utqiaġvik to Kaktovik and determined that ringed seal density was greatest in water depths between 16 and 115 ft. (5 and 35 m), and in relatively flat ice close to the fast ice edge. Aerial surveys conducted in association with construction near the Northstar facility found ringed seal densities ranged from 0.39 to 0.83 seals per km^2 (Moulton *et al.* 2005).

Historically, ringed seal occurrence in or near the activity area has been minimal, and large concentrations of seals are not expected near West Dock during project operations. However, ringed seals may occur in the project area during the open-water season or during AGDC's winter/spring contingency period.

Spotted Seal

The Alaska stock of spotted seals are found along the continental shelf of the Bering, Chukchi, and Beaufort Seas. During the late fall through spring, when seals are hauled out on sea ice, whelping, nursing, breeding, and molting occurs. After the sea ice has melted, most spotted seals haul out on land in the summer and fall (Boveng *et al.* 2009). Pupping occurs along the Bering Sea ice front during March and April, followed by mating and molting in May and June (Quakenbush 1988). During the summer, the seals follow the retreating ice north into the Chukchi and Beaufort seas, and haul out on lagoon and river delta beaches during the open water period. The migration back to the Bering Sea wintering grounds begins with sea ice advancement, usually in October (Lowry *et al.* 1998).

Spotted seals were recorded during barging activities between Prudhoe Bay and Cape Simpson from 2005–2007 (Green and Negri 2005, 2006; Green *et al.* 2007). Between 23 and 54 seals were observed annually, with the peak distributions found off the Colville and Piasuk rivers. Savarese *et al.* (2010) surveyed the central Beaufort Sea from 2006 to 2008 and recorded greater numbers of animals, with 59 to 125 spotted seals observed annually. Lomac-MacNair *et al.* (2014) observed 37 spotted seals in Prudhoe Bay (and another 39 that were either spotted or ringed seals), including several in the immediate vicinity of West Dock, while monitoring July–August seismic activity.

Sighting data indicate that spotted seals could be present in the project area during the summer months, however,

we do not expect spotted seals to occur in the project area during AGDC's contingency period.

Bearded Seal

The Alaska stock of bearded seals occur seasonally in the shallow shelf waters of the Beaufort, Chukchi, and Bering Seas (Cameron *et al.* 2010). Bearded seals are closely associated with ice and their migration coincides with the sea ice retreat and advancement. Some seals are found in the Beaufort Sea year-round; however, most prefer to winter in the Bering Sea and summer in areas with high ice coverage (70–90 percent) in the Chukchi and Beaufort seas (Simpkins *et al.* 2003; Bengston *et al.* 2005). The stock feeds primarily on benthic organisms and demersal fishes, and is therefore, closely linked to shallow waters that are less than 656 ft. (200 m) where they can reach the seafloor to forage (Muto *et al.* 2018).

Aerial surveys conducted in the Beaufort Sea indicated that bearded seals preferred water depths between 82–246 ft (25–75 m) and areas of open ice cover (Cameron *et al.* 2010). ASAMM commonly observe bearded seals offshore in the Beaufort Sea; however, no sightings have been observed in the West Dock activity area. Based on bearded seal water depth and ice coverage preferences, survey observations in the Prudhoe Bay region, and the normal level of ongoing industrial activity in the project area, only very small numbers of bearded seals are expected near the project area.

Critical habitat has not been designated for the bearded seal (Muto *et al.* 2018).

In summary, bearded seals may occur in the project area during the open water season. Bearded seals could potentially occur in the project area during AGDC's winter/spring contingency period, however, we would expect very few, if any, bearded seals to be present during this time.

Unusual Mortality Events (UME)

A UME is defined under the MMPA as a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response. Currently, there are ongoing UME investigations in Alaska involving gray whales and ice seals.

Since January 1, 2019, elevated gray whale strandings have occurred along the west coast of North America from Mexico through Alaska. This event has been declared an Unusual Mortality Event (UME), though a cause has not yet been determined. More information is available at *https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2020-gray-whale-unusual-mortality-event-along-west-coast.*

Since June 1, 2018, elevated ice seal strandings have occurred in the Bering and Chukchi seas in Alaska. This event has been declared an Unusual Mortality Event (UME), though a cause has not yet been determined. More information is available at *https://www.fisheries.noaa.gov/national/marine-life-distress/2018-2020-ice-seal-unusual-mortality-event-alaska.*

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 decibel (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. Marine mammal hearing groups and their associated hearing ranges are provided in Table 6.

TABLE 6—MARINE MAMMAL HEARING GROUPS

[NMFS, 2018]

Hearing group	Generalized hearing range *
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz.
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz.
High-frequency (HF) cetaceans (true porpoises, *Kogia,* river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*).	275 Hz to 160 kHz.
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz.
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz.

* Represents the generalized hearing range for the entire group as a composite (*i.e.,* all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al.* 2007) and PW pinniped (approximation).

The pinniped functional hearing group was modified from Southall *et al.* (2007) on the basis of data indicating that phocid species (which include ringed, spotted, and bearded seals) 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. As noted above, six marine mammal species (three cetacean and three phocid pinniped species) have the reasonable potential to co-occur with the proposed survey activities. Please refer to Table 5. Of the cetacean species that may be present, two are classified as low-frequency cetaceans (*i.e.,* gray whale and bowhead whale) and one is classified as a mid-frequency cetacean (*i.e.,* beluga whale).

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 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 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 Sources

The marine soundscape is comprised of both ambient and anthropogenic sounds. Ambient sound is defined as the all-encompassing sound in a given place and is usually a composite of sound from many sources both near and far. The sound level of an area is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.,* waves, wind, precipitation, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.,* vessels, dredging, aircraft, construction). 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. In-water construction activities associated with the project would include vibratory pile driving and removal and impact pile driving. The sounds produced by these activities fall into one of two general sound types: Impulsive and non-impulsive. Impulsive sounds (*e.g.,* explosions, gunshots, sonic booms, impact pile driving) are typically transient, brief (less than one second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI 1986; NIOSH 1998; ANSI 2005; NMFS, 2018). Non-impulsive sounds (*e.g.,* aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems) can be broadband, narrowband or tonal, brief or prolonged (continuous or intermittent), and typically do not have the high peak sound pressure with raid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998; NMFS 2018). 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).

Two types of pile hammers would be used on this project: Impact and vibratory. Impact hammers operate by repeatedly dropping a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper, 2005). Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound than impact hammers. Peak sound pressure levels (SPLs) may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman *et al.,* 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards 2002; Carlson *et al.,* 2005).

The likely or possible impacts of AGDC's proposed activity on marine mammals could involve both non-acoustic and acoustic stressors. Potential non-acoustic stressors could result from the physical presence of the equipment and personnel; however, any impacts to marine mammals are expected to primarily be acoustic in nature. Acoustic stressors include effects of heavy equipment operation during pile installation and removal.

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from pile driving and removal is the primary means by which marine mammals may be harassed from AGDC's specified activity. Animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall *et al.,* 2007). In general, exposure to pile driving and removal noise has the potential to result in auditory threshold shifts and behavioral reactions (*e.g.,* avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). Exposure to anthropogenic noise can also lead to non-observable physiological responses such as an increase in stress hormones. Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection. The effects of pile driving and removal noise on marine mammals are dependent on several factors, including, but not limited to, sound type (*e.g.,* impulsive vs. non-impulsive), the species, age and sex class (*e.g.,* adult male vs. mom with calf), duration of exposure, the distance between the pile and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok *et al.,* 2004; Southall *et al.,* 2007). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects and potential impacts on habitat. NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). The amount of threshold shift is customarily expressed in dB. A TS can be permanent or temporary. As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal temporal pattern (*e.g.,* impulsive or non-impulsive), likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, time to recovery (seconds to minutes or hours to days), the frequency range of the exposure (*i.e.,* spectral content), the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.,* how an animal uses sound within the frequency band of the signal; *e.g.,* Kastelein *et al.,* 2014), and the overlap between the animal and the source (*e.g.,* spatial, temporal, and spectral).

Permanent Threshold Shift (PTS)—NMFS defines PTS as a permanent,

irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Available data from humans and other terrestrial mammals indicate that a 40 dB threshold shift approximates PTS onset (see Ward *et al.,* 1958, 1959; Ward 1960; Kryter *et al.,* 1966; Miller 1974; Ahroon *et al.,* 1996; Henderson *et al.,* 2008). PTS levels for marine mammals are estimates; with the exception of a single study unintentionally inducing PTS in a harbor seal (*Phoca vitulina*) (Kastak *et al.,* 2008), there are no empirical data measuring PTS in marine mammals largely due to the fact that, for various ethical reasons, experiments involving anthropogenic noise exposure at levels inducing PTS are not typically pursued or authorized (NMFS 2018).

Temporary Threshold Shift (TTS)—NMFS defines TTS as a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Based on data from cetacean TTS measurements (see Southall *et al.,* 2007), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al.,* 2000; Finneran *et al.,* 2000, 2002). As described in Finneran (2015), marine mammal studies have shown the amount of TTS increases with cumulative sound exposure level (SELcum) in an accelerating fashion: At low exposures with lower SELcum, the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher SELcum, the growth curves become steeper and approach linear relationships with the noise SEL.

Depending on the degree (elevation of threshold in dB), duration (*i.e.,* recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). 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 takes place during a time when the animal is traveling through the open ocean, where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. We note that reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.,* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin (*Tursiops truncatus*), beluga whale, harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*)) and five species of pinnipeds exposed to a limited number of sound sources (*i.e.,* mostly tones and octave-band noise) in laboratory settings (Finneran 2015). TTS was not observed in trained spotted and ringed seals exposed to impulsive noise at levels matching previous predictions of TTS onset (Reichmuth *et al.,* 2016). In general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran 2015). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. No data are available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al.,* (2007), Finneran and Jenkins (2012), Finneran (2015), and Table 5 in NMFS (2018). Installing piles requires vibratory and impact pile driving in this project. There would likely be pauses in activities producing the sound during each day. Given these pauses and that many marine mammals are likely moving through the ensonified area and not remaining for extended periods of time, the potential for TS declines.

Behavioral Harassment—Exposure to noise from pile driving and removal also has the potential to behaviorally disturb marine mammals. Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.,* Lusseau and Bejder 2007; Weilgart 2007; NRC 2005).

Disturbance may result in 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. Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.,* species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.,* Richardson *et al.,* 1995; Wartzok *et al.,* 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). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see Appendices B–C of Southall *et al.,* (2007) for a review of studies involving marine mammal behavioral responses to sound. 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.

Stress responses—An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.,* Seyle 1950; Moberg 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness. Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.,* Moberg, 1987; Blecha, 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.,* 2004).

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

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.,* Holberton *et al.,* 1996; Hood *et al.,* 1998; Jessop *et al.,* 2003; Krausman *et al.,* 2004; Lankford *et al.,* 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker, 2000; Romano *et al.,* 2002b) and, more rarely, studied in wild populations (*e.g.,* Romano *et al.,* 2002a). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales (*Eubalaena glacialis*). 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); however, distress is an unlikely result of this project based on observations of marine mammals during previous, similar projects in the area.

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.,* pile driving, 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. Masking of natural sounds can result when human activities produce high levels of background sound at frequencies important to marine mammals. Conversely, if the background level of underwater sound is high (*e.g.* on a day with strong wind and high waves), an anthropogenic sound source would not be detectable as far away as would be possible under quieter conditions and would itself be masked.

Airborne Acoustic Effects—We do not expect harassment as a result of airborne sound, as there are no haul out sites near West Dock during the open water season. If AGDC must work during their contingency period, they will begin pile driving prior to March 1 (see Proposed Mitigation), so we would not expect ringed seals to build their lairs close enough to the project site to be taken by in-air sound during the contingency period. Therefore, we do not believe that authorization of incidental take resulting from airborne sound is warranted, and airborne sound is not discussed further here.

Marine Mammal Habitat Effects

AGDC's construction activities could have localized, temporary impacts on marine mammal habitat by increasing in-water sound pressure levels, disturbing benthic habitat, and increased turbidity. Construction activities are of short duration and would likely have temporary impacts on marine mammal habitat through increases in underwater sound. Increased noise levels may affect acoustic habitat (see masking discussion above) and adversely affect marine mammal prey in the vicinity of the project area (see discussion below). During vibratory pile driving, elevated levels of underwater noise would ensonify the area where both fish and mammals may occur and could affect foraging success. Additionally, marine mammals may avoid the area during construction; any displacement due to noise is expected to be temporary and is not expected to result in long-term effects to the individuals or populations.

Additionally, winter construction activities, including through-ice surveying and through-ice grading could potentially disturb ice habitat, as ice will be cut and removed to facilitate grading the seafloor. Work is expected to begin immediately after the ice becomes grounded, which typically occurs in the work area on or before February 1. These activities could affect available ringed seal habitat, however, ringed seal density is low in areas with water depths less than 10 feet (3 meters; Moulton et al. 2005), and the grounded ice conditions suitable for construction activities are not preferred habitat for ringed seals. Additionally, winter construction activities would begin prior to March 1, further reducing the potential for disturbance to ringed seal birth lairs.

In-Water Construction Effects on Potential Foraging Habitat

Potential prey (*i.e.,* fish) may avoid the immediate area due to the temporary loss of this foraging habitat during pile driving activities. The duration of fish avoidance of this area after pile driving stops is unknown, but we anticipate a rapid return to normal recruitment, distribution and behavior. Any behavioral avoidance by fish of the disturbed area would still leave large areas of fish and marine mammal foraging habitat in the nearby vicinity.

Additionally, a small amount of seafloor habitat will be disturbed as a result of pile driving, gravel deposition, screeding, and other seabed preparation. Benthic infauna abundance and diversity are very low in this area, likely due to the shallow water depth (<16 feet [5 meter]), run-off from adjacent rivers, and ice related stress (Carey et al. 1984). Freezing and thawing sea ice and river runoff during the summer melting season significantly affect the coastal water mass characteristics and decrease the salinity. River outflow and coastal erosion also transport significant amounts of suspended sediments (BPXA 2009). Sea ice pressure ridges scour and gouge the seafloor and move sediments, creating natural, seasonal disruptions of the seafloor. These factors result in a less than favorable habitat for benthic organisms in the activity area. Bottom disturbance is a natural and frequent occurrence in this nearshore region resulting in benthic communities with patchy distributions (Carey *et al.* 1984). Given the low nearshore densities of benthic prey items, we do not expect screeding, pile driving, or related construction activities to have significant impacts on marine mammal foraging habitat. Additionally, installation of the new DH4 and barge bridge abutments will cover the associated seafloor; however, the total seafloor area affected from installing the structures is a very small area compared to the vast foraging area available to marine mammals in the Beaufort Sea, particularly given the limited prey expected to be in the West Dock area.

In addition to ensonification and seafloor disturbance, a temporary and localized increase in turbidity near the seafloor would occur in the immediate area surrounding the area where piles are installed and removed, and where screeding and seabed preparation will take place. The screeding process redistributes seabed materials to create a flat even seafloor surface without the need for excavation or disposal of materials. Screeding would occur each summer immediately prior to the arrival of the first cargo barge, and would likely increase turbidity in the immediate area around West Dock. Turbidity and sedimentation rates are naturally high in this region due to ice scouring and gouging of the seafloor and significant amounts of suspended sediments from river outflow and coastal erosion. Therefore, the additional turbidity resulting from screeding activities is not anticipated to have a significant impact. The sediments on the sea floor will also be disturbed during pile driving; however, like during screeding, sediment suspension will be brief and localized and is unlikely to measurably affect marine mammals or their prey in the area. In general, turbidity associated with pile installation is localized to about a 25-ft radius around the pile (Everitt *et al.,* 1980). Cetaceans are not expected to be close enough to the project pile driving areas to experience effects of turbidity, and any pinnipeds are able to easily avoid localized areas of turbidity. Therefore, the impact from increased turbidity levels is expected to be discountable to marine mammals. Furthermore, pile driving and removal at the project site would not obstruct movements or migration of marine mammals.

Impacts to potential foraging habitat are expected to be temporary and minimal based on the short duration of activities.

In-Water Construction Effects on Potential Prey

Numerous fish and invertebrate species occur in Prudhoe Bay and the Beaufort Sea, and could be affected by the construction activities that would produce continuous (*i.e.,* vibratory pile driving) and impulsive (*i.e.,* impact pile driving) sounds. Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.,* Scholik and Yan 2001, 2002; Popper and Hastings 2009). Sound pulses at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Pearson *et al.,* 1992; Skalski *et al.,* 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality.

The most likely impact to fish from pile driving activities at the project site would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but as noted above, a rapid return to normal recruitment, distribution and behavior is anticipated.

Popper and Hastings (2009) reviewed information on the effects of pile driving and concluded that there are no substantive data on whether the high sound levels from pile driving or any man-made sound would have physiological effects on invertebrates. Any such effects would presumably be limited to the area very near (3–16 ft. [1–5 m]) the sound source and would result in no population effects due to the relatively small area affected at any one time and the reproductive strategy of most zooplankton species (short generation, high fecundity, and very high natural mortality). No adverse impact on zooplankton populations would be expected to occur from these activities, due in part to large reproductive capacities and naturally high levels of predation and mortality of these populations. Any mortalities or impacts that might occur would be expected to be negligible compared to the naturally occurring high reproductive and mortality rates.

As noted above, due to the limited presence of benthic invertebrates in the West Dock area, we do not expect screeding and seafloor preparation activities to result in a significant loss of benthic prey availability, particularly in comparison to the vast foraging area available to marine mammals in the Beaufort Sea.

In summary, given the short daily duration of sound associated with individual pile driving events and the relatively small areas being affected, pile driving activities associated with the proposed action are not likely to have a permanent, adverse effect on any fish or invertebrate habitat, or populations of fish or invertebrate species. Thus, we conclude that impacts of the specified activity are not likely to have more than short-term adverse effects on any prey habitat or populations of prey species. Further, any impacts to marine mammal habitat are not expected to result in significant or long-term consequences for individual marine mammals, or to contribute to adverse impacts on their populations.

Estimated Take

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 acoustic source (*i.e.,* vibratory and impact pile driving) has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result, primarily for phocids, due to their lack of visibility and the size of the Level A harassment zones. Auditory injury is unlikely to occur to cetaceans. The proposed mitigation and monitoring measures are expected to minimize the severity of the 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

NMFS recommends the use of 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).

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. 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 non-explosive impulsive (*e.g.,* seismic airguns) or intermittent (*e.g.,* scientific sonar) sources.

AGDC's construction activity includes the use of continuous (vibratory pile driving) and impulsive (impact pile driving) sources, and therefore the 120 and 160 dB re 1 µPa (rms) are applicable.

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). AGDC's construction activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving) 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 *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance.*

TABLE 7—THRESHOLDS IDENTIFYING THE ONSET OF PERMANENT THRESHOLD SHIFT

Hearing group	PTS onset acoustic thresholds * (received level)	
	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 1µPa^{2}s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (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.

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.

The sound field in the project area is the existing background noise plus additional construction noise from the proposed project. Marine mammals are expected to be affected via sound generated by the primary components of the project (*i.e.,* vibratory pile driving and removal). The maximum (underwater) area ensonified above the

thresholds for behavioral harassment referenced above is 67.7km² (26.1mi²), and the calculated distance to the farthest behavioral isopleth is approximately 4.6km (2.9mi).

The project includes vibratory pile installation and removal and impact pile installation. Source levels for these activities are based on reviews of measurements of the same or similar types and dimensions of piles available in the literature. Source levels for each pile size and activity are presented in Table 8. Source levels for vibratory installation and removal of piles of the same diameter are assumed to be the same.

TABLE 8—SOUND SOURCE LEVELS FOR PILE DRIVING

Pile size and type	Hammer type	Source level (at 10m)			Literature source
		SPL_{rms}	Peak	SEL	
11.5-inch H-Pile	Impact	183	200	170	Caltrans 2015 (12-in H-Pile).
14-inch H-Pile	Impact	187	208	177	Caltrans 2015 (14-in H-Pile).
	Vibratory	150	160	150	Caltrans 2015 (12-in H-Pile).
48-inch Pipe Pile	Impact	195	210	185	Caltrans 2015 (60-in CISS Pile).
Sheet Piles (19.69-inch and 25-inch).	Vibratory	160	175	160	Caltrans 2015 (AZ Sheet Pile).

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

TL = B * Log10 (R1/R2),

where

TL = transmission loss in dB
B = transmission loss coefficient
R1 = the distance of the modeled SPL from the driven pile, and
R2 = the distance from the driven pile of the initial measurement

Absent site-specific acoustical monitoring with differing measured transmission loss, a practical spreading value of 15 is used as the transmission loss coefficient in the above formula. Project and site-specific transmission loss data for the Prudhoe Bay portion of AGDC's AK LNG project are not available; therefore, the default coefficient of 15 is used to determine the distances to the Level A and Level B harassment thresholds.

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, we 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 such as pile driving, NMFS User Spreadsheet predicts the distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would incur PTS. Inputs used in the User Spreadsheet, and the resulting isopleths are reported below.

TABLE 9—USER SPREADSHEET INPUT PARAMETERS USED FOR CALCULATING LEVEL A HARASSMENT ISOPLETHS

	11.5-inch H-pile	14-inch H-pile	14-inch H-pile	48-inch pipe pile	19.69-inch sheet piles	25-inch sheet piles
Spreadsheet Tab Used.	E.1) Impact pile driving.	E.1) Impact pile driving.	A.1) Vibratory pile driving.	E.1) Impact pile driving.	A.1) Vibratory pile driving.	A.1) Vibratory pile driving
Weighting Factor Adjustment (kHz).	2	2	2.5	2	2.5	2.5
Source Level	170 dB SEL	177 dB SEL	150 SPL_{rms}	185 dB SEL	160 SPL_{rms}	160 SPL_{rms}
Number of piles within 24-h period [a].	26.09 [b]	4	8	1.25	15.24 [b]	12
Duration to drive a single pile (minutes).			15		18.9	24
Number of strikes per pile.	1,000	1,000		1,000		
Propagation (xLogR).	15	15	15	15	15	15
Distance from source level measurement (meters).	10	10	10	10	10	10

[a] These estimates include contingencies for weather, equipment, work flow, and other factors that affect the number of piles per day, and are assumed to be a maximum anticipated per day. Given that AGDC plans to pile drive up to 24 hours per day, it is appropriate to assume that the number of piles installed within the 24-hour period may not be a whole number.

[b] These averages assume that AGDC will drive 11.5-inch H-piles and sheet piles at a rate of 25 feet per day.

TABLE 10—CALCULATED DISTANCES TO LEVEL A AND LEVEL B HARASSMENT ISOPLETHS

Activity	Hammer type	Level A harassment zone (m)			Level B harassment zone (m)
		LF cetaceans	MF cetaceans	Phocids	
11.5-inch H-Pile	Impact	1,194	43	639	341
14-inch H-Pile	Impact	1,002	36	536	631
	Vibratory	2	<1	1	1,000
48-inch Pipe Pile	Impact	1,575	56	843	2,154
19.69-inch Sheet Piles	Vibratory	17	2	10	4,642
25-inch Sheet Piles	Vibratory	17	2	10	4,642

Level A harassment zones are typically smaller than Level B harassment zones. However, in rare cases such as the impact pile driving of the 11.5-inch and 14-inch H-piles in AGDC's project, the calculated Level A harassment isopleth is greater than the calculated Level B harassment isopleth. Calculation of Level A harassment isopleths include a duration component, which in the case of impact pile driving, is estimated through the total number of daily strikes and the associated pulse duration. For a stationary sound source such as impact pile driving, we assume here that an animal is exposed to all of the strikes expected within a 24-hour period. Calculation of a Level B harassment zone does not include a duration component. Depending on the duration included in the calculation, the calculated Level A harassment isopleths can be larger than the calculated Level B harassment isopleth for the same activity.

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.

Each fall and summer, NMFS and BOEM conduct an aerial survey in the Arctic, the ASAMM surveys (Clarke *et al.,* 2012, 2013a, 2014, 2015, 2017a, 2017b, 2018, 2019). The goal of these surveys is to document the distribution and relative abundance of bowhead, gray, right, fin and beluga whales and other marine mammals in areas of potential oil and natural gas exploration, development, and production activities in the Alaskan Beaufort and northeastern Chukchi Seas. Traditionally, only fall surveys were conducted but, in 2011, the first dedicated summer survey effort began in the ASAMM Beaufort Sea study area. AGDC used these ASAMM surveys as the data source to estimate seasonal densities of cetaceans (bowhead, gray and beluga whales) in the project area. The ASAMM surveys are conducted within blocks that overlay the Beaufort and Chukchi Seas oil and gas lease sale areas offshore of Alaska (Figure 16 in AGDC's application), and provide sighting data for bowhead, gray, and beluga whales during summer and fall months. During the summer and fall, NMFS observed for marine mammals on effort for 13,484 km and 12,846 km, respectively, from 2011 through 2018. Data from those surveys are used for this analysis. We note that the proposed Prudhoe Bay portion of the AK LNG project is in ASAMM survey block 1; the inshore boundary of this block terminates at the McClure Island group. It was not until 2016 that on-effort surveys began inside the McClure Island group (including Prudhoe Bay) since bowhead whales, the focus of the surveys, are not likely to enter this area, given its shallow depth. However, no bowheads and only one beluga whale have been observed in block 1a (including Prudhoe Bay). Therefore, the density estimates provided here are an overestimate because they rely on offshore surveys where marine mammals are more likely to be present.

Bowhead Whale

AGDC calculated density estimates for bowhead whale by dividing the average number of whales observed per km of transect effort in ASAMM Block 1 (whales/km in Table 11) by two times the effective strip width (ESW) to encompass both sides of the transect line (whales per km/(2 × ESW). The ESW for bowhead whales from the Aero Commander aircraft is 1.15 km (0.71 mi) (Ferguson and Clarke 2013). Therefore, the summer density estimate is 0.005 bowhead whales/km^2, and the fall density estimate is 0.017 bowhead whales/km^2. The resulting densities are expected to be overestimates for the AK LNG analysis because the data is based on sighting effort outside of the barrier islands, and bowhead whales rarely occur within the barrier islands. However, AGDC conservatively used the higher fall density to estimate potential Level B harassment takes.

As noted in the Description of Marine Mammals in the Area of Specified Activities section, we do not expect bowhead whales to be present during AGDC's winter/spring contingency pile driving period.

TABLE 11—BOWHEAD WHALE SIGHTING DATA FROM 2011 THROUGH 2018 AND RESULTING DENSITIES

Year	Summer				Fall			
	Number of whales sighted	Transect effort (km)	Whales/km	Whales/km^2 [a]	Number of whales sighted	Transect effort (km)	Whales/km	Whales/km^2 [a]
2011	1	346	0.003	0.001	24	1,130	0.021	0.009
2012	5	1,493	0.003	0.001	17	1,696	0.010	0.004
2013	21	1,582	0.013	0.006	21	1,121	0.019	0.008
2014	17	1,393	0.012	0.005	79	1,538	0.051	0.022
2015	15	1,262	0.012	0.005	17	1,663	0.010	0.004
2016	97	1,914	0.051	0.022	23	2,360	0.010	0.004
2017	8	3,003	0.003	0.001	255	1,803	0.141	0.061
2018	2	2,491	0.001	0.0004	69	1,535	0.045	0.020

TABLE 11—BOWHEAD WHALE SIGHTING DATA FROM 2011 THROUGH 2018 AND RESULTING DENSITIES—Continued

Year	Summer				Fall			
	Number of whales sighted	Transect effort (km)	Whales/km	Whales/km^{2} [a]	Number of whales sighted	Transect effort (km)	Whales/km	Whales/km^{2} [a]
Total	166	13,484	[b] 0.012	[b] 0.005	505	12,846	[b] 0.039	[b] 0.017

[a] Calculated using an effective strip width of 1.15 km.
[b] Value represents average, not total, across all years.

Gray Whale

Gray whale sightings in the Beaufort Sea have increased in recent years, however, encounters are still infrequent. AGDC calculated density estimates for gray whale by dividing the average number of whales observed per km of transect effort (whales/km in Table 12) by two times the ESW to encompass both sides of the transect line (whales per km/(2 × ESW). The ESW for gray whales from the Aero Commander aircraft is 1.20 km (0.75 mi) (Ferguson and Clarke 2013). Therefore, the summer and fall density estimates are both 0.00003 gray whales/km^{2}. The resulting densities are expected to be overestimates for the AK LNG analysis because the data is based on sighting effort outside of the barrier islands, and gray whales rarely occur within the barrier islands as evidenced by Block 1A ASAMM surveys.

As noted in the Description of Marine Mammals in the Area of Specified Activities section, we do not expect gray whales to be present during AGDC's winter/spring contingency pile driving period.

TABLE 12—GRAY WHALE SIGHTING DATA FROM 2011 THROUGH 2018 AND RESULTING DENSITIES

Year	Summer				Fall			
	Number of whales sighted	Transect effort (km)	Whales/km	Whales/km^{2} [a]	Number of whales sighted	Transect effort (km)	Whales/km	Whales/km^{2} [a]
2011	0	346	0	0	0	1,130	0	0
2012	0	1,493	0	0	0	1,696	0	0
2013	0	1,582	0	0	0	1,121	0	0
2014	0	1,393	0	0	1	1,538	0.0007	0.0003
2015	0	1,262	0	0	0	1,663	0	0
2016	1	1,914	0.003	0.001	0	2,360	0	0
2017	0	3,003	0	0	0	1,803	0	0
2018	0	2,491	0	0	0	1,535	0	0
Total	1	13,484	[b] 0.00007	[b] 0.00003	1	12,846	[b] 0.00008	[b] 0.00003

[a] Calculated using an effective strip width of 1.20 km.
[b] Value represents average, not total, across all years.

Beluga Whale

AGDC calculated beluga densities for survey block 1 (the area offshore from the McClure Island group) using ASAMM data collected from 2014–2018. Beluga sighting data was included in surveys from 2011 to 2013, however, this data is only summarized by depth zone, rather than by survey block. Therefore, the National Marine Mammal Laboratory (Megan Ferguson, pers. comm., November 18, 2019), advised NMFS and AGDC to calculate beluga whale density using the 2014–2018 ASAMM data, as it is more recent and incorporates more years. Density estimates for beluga whale were calculated by dividing the average number of whales observed per km of transect effort (whales/km in Table 13) by two times the effective strip width to encompass both sides of the transect line (whales per km/(2 × ESW). The ESW for beluga whales from the Aero Commander aircraft is 0.614 km (0.38 mi) (Ferguson and Clarke 2013). The resulting summer density estimate is 0.005 beluga whales/km^{2}, and the fall density estimate is 0.001 beluga whales/km^{2}. AGDC conservatively used the higher summer density to estimate potential Level B harassment takes.

The resulting densities are expected to be overestimates for the AK LNG analysis because the data is based on sighting effort outside of the barrier islands, and beluga whales rarely occur within the barrier islands, as evidenced by Block 1a ASAMM survey data. Block 1a encompasses the area between the shoreline and the barrier islands, including Prudhoe Bay. One beluga whale was observed in survey block 1a in 2018. However, this sighting was a ''sighting on search'' and therefore was not included in the density calculation.

As noted in the Description of Marine Mammals in the Area of Specified Activities section, we do not expect beluga whales to be present during AGDC's winter/spring contingency pile driving period.

TABLE 13—BELUGA WHALE SIGHTING DATA FROM 2011 THROUGH 2018 AND RESULTING DENSITIES

Year	Summer				Fall			
	Number of whales sighted	Transect effort (km)	Whales/km	Whales/km^{2} [a]	Number of whales sighted	Transect effort (km)	Whales/km	Whales/km^{2} [a]
2014	13	1,393	0.009	0.008	9	1,538	0.006	0.005
2015	37	1,262	0.029	0.024	3	1,663	0.002	0.001
2016	0	1,914	0	0	1	2,360	0.0004	0.0003
2017	4	3,003	0.001	0.001	0	1,803	0	0
2018	6	2,491	0.002	0.002	0	1,535	0	0
Total	60	10,063	[b] 0.006	[b] 0.005	13	8,899	[b] 0.001	[b] 0.001

[a] Calculated using an effective strip width of 0.614 km.
[b] Value represents average, not total, across all years.

Ringed Seal

Ringed seals are the most abundant species in the project area. They haul out on the ice to molt between late May and early June, and spring aerial surveys provide the most comprehensive density estimates available. Industry monitoring programs for the construction of the Northstar production facility conducted spring aerial surveys in the area surrounding West Dock from 1997 to 2002 (Frost *et al.,* 2002; Moulten *et al.,* 2002b; Moulton *et al.,* 2005; Richardson and Williams, 2003). Spring surveys are expected to provide the best ringed seal density information, as the greatest percentage of seals have abandoned their lairs and are hauled out on the ice (Kelly *et al.,* 2010). Densities were consistently very low in areas where the water depth was less than 10 ft. (3 m), and only sightings observed in water depths greater than 10 ft. (3 m) have been included in the density calculations (Moulton *et al.,* 2002a, Moulton *et al.,* 2002b, Richardson and Williams, 2003). The average observed spring ringed seal density from this monitoring effort was 0.548 seals/km^{2} (Table 14). These densities are not corrected for unobserved animals, and therefore may result in an underestimated density.

TABLE 14—RINGED SEAL DENSITIES ESTIMATED FROM SPRING AERIAL SURVEYS CONDUCTED FROM 1997 TO 2002

Year	Density (Seals/km^{2})
1997	0.43
1998	0.39
1999	0.63
2000	0.47
2001	0.54
2002	0.83
Average	0.548

In order to generate a summer density, as AGDC expects that the majority of their work will occur during the summer, we first begin with the spring density. Summer densities in the project area are expected to significantly decrease as ringed seals range considerable distances during the open water season. Summer density was estimated to be 50 percent of the spring density (0.548 seals/km^{2}), resulting in a summer density estimate of 0.274 ringed seals/km^{2}. Like summer density estimates, fall density data are limited. Ringed seals remain in the water through the fall and into the winter. Given the lack of data, fall density is assumed the same as the summer density of 0.274 ringed seals/km^{2}.

During the winter months, ringed seals create subnivean lairs and maintain breathing holes in the landfast ice. Tagging data suggest that ringed seals utilize multiple lairs and Kelly *et al.* (1986) determined that, on average, one seal used 2.85 lairs, although the authors suggested that this is likely an underestimate. Density estimates for the number of ringed seal ice structures have been calculated (Frost and Burns 1989; Kelly *et al.* 1986; Williams *et al.* 2001), and the average density of ice structures from these reports is 1.58/km^{2}.

To estimate ringed seal density in the winter, the average ice structure density (1.58/km^{2}) was divided by the average number of structures used by the seals (2.85 structures). The estimated density is 0.509 ringed seals/km^{2} in the winter; however, this is likely an overestimate as the average number of ice structures utilized is thought to be an underestimate (Kelly *et al.,* 1986).

While more recent ASAMM surveys have been conducted in the project area (2016–2018), these surveys did not identify observed pinnipeds to species (Clarke *et al.,* 2019).

TABLE 15—RINGED SEAL ICE STRUCTURE DENSITY IN THE VICINITY OF THE PROJECT AREA

Year	Ice structure density (structures per km^{2})	Source
1982	3.6	Frost and Burns 1989.
1983	0.81	Kelly *et al.,* 1986.
1999	0.71	Williams *et al.,* 2001.
2000	1.2	Williams *et al.,* 2001.
Average Density	1.58	

Given that AGDC will only pile drive during the winter if they are unable to complete the work during the summer and fall open water season, AGDC estimated ringed seal takes using summer densities, rather than winter. NMFS concurs with this approach.

Spotted Seal

The spotted seal occurs in the Beaufort Sea in small numbers during the summer open water period. At the

onset of freeze-up in the fall, spotted seals return to the Chukchi and then Bering Sea to spend the winter and spring. As such, we do not expect spotted seals to occur in the project area during AGDC's winter/spring contingency period.

Only a few of the studies referenced in calculating the ringed seal densities also include data for spotted seals. Given the limited spotted seal data, NMFS expects that relying on this data may result in an underestimate, and that it is more conservative to calculate the spotted seal density as a proportion of the ringed seal density. Therefore, summer spotted seal density was estimated as a proportion of the ringed seal summer density based on the percentage of pinniped sightings observed during monitoring projects in the region (Harris *et al.,* 2001; Aerts *et al.,* 2008; Hauser *et al.,* 2008; HDR 2012). Spotted seals comprised 20 percent of the pinniped sightings during these monitoring efforts. Therefore, summer spotted seal density was calculated as 20 percent of the ringed seal density of 0.274 seals/km^2. This results in an estimated spotted seal summer density of 0.055 seals/km^2.

Bearded Seal

The majority of bearded seals spend the winter and spring in the Chukchi and Bering seas; however, some remain in the Beaufort Sea year-round. A reliable population estimate for the bearded seal stock is not available, and occurrence in the Beaufort Sea is less known than that in the Bering Sea. Spring aerial surveys conducted as part of industry monitoring for the Northstar production facility provide limited sighting numbers from 1999–2002 (Moulton *et al.,* 2000, Moulton *et al.,* 2001, Moulton *et al.,* 2002a, Moulton *et al.,* 2003). During the 4 years of survey, an average of 11.75 bearded seals were observed during 3,997.5 km^2 of effort. Using this data, winter and spring density are estimated to be 0.003 bearded seals/km^2.

Bearded seals occur in the Beaufort Sea more frequently during the open water season, rather than other parts of the year. They prefer waters farther offshore. Only a few of the studies referenced in calculating the ringed seal densities also include data for bearded seals. Given the limited bearded seal data, NMFS expects that relying on this data may result in an underestimate, and that it is more conservative to calculate the bearded seal density as a proportion of the ringed seal density. Therefore, summer density was estimated as a proportion of the ringed seal summer density based on the percentage of pinniped sightings observed during monitoring projects in the region (Harris *et al.,* 2001; Aerts *et al.,* 2008; Hauser *et al.,* 2008; HDR 2012). Bearded seals comprised 17 percent of the pinniped sightings during these monitoring efforts. Therefore, summer bearded seal density was calculated as 17 percent of the ringed seal density of 0.274 seals/km^2. This results in an estimated bearded seal summer density of 0.047 seals/km^2. The same estimate is assumed for bearded seal fall density.

As noted in the Description of Marine Mammals in the Area of Specified Activities section and in Table 16, bearded seals could potentially occur in the project area during AGDC's winter/spring contingency period. However, we would expect very few, if any, bearded seals to be present during this time. In consideration of this species presence information, and AGDC's plan to conduct most construction during the open-water season, NMFS used the summer density in the take calculation described below.

TABLE 16—MARINE MAMMAL DENSITIES IN THE GEOGRAPHIC REGION BY SEASON

Species	Winter (Nov–Mar)	Spring (Apr–Jun) [a]	Summer (Jul–Aug)	Fall (Sept–Oct)
Bowhead Whale	0	0	0.005	0.017
Gray Whale	0	0	0.00003	0.00003
Beluga Whale	0	0	0.005	0.001
Ringed Seal	0.507	0.548	0.274	0.274
Spotted Seal	0	0	0.055	0
Bearded Seal	0.003	0.003	0.047	0.047

[a] AGDC's pile driving contingency period extends from late February to April 2023, however, very little if any pile driving is likely to occur in April.

Take Calculation and Estimation

In this section, we describe how the information provided above is brought together to produce a quantitative take estimate.

To calculate estimated Level A and Level B harassment takes, AGDC multiplied the area (km^2) estimated to be ensonified above the Level A or Level B harassment thresholds for each species, respectively, for pile driving (and removal) of each pile size and hammer type by the duration (days) of that activity in that season by the seasonal density for each species (number of animals/km^2).

AGDC expects that construction will likely be completed during the open-water construction season. AGDC calculated that the construction will require approximately 164 days of in-water work; however, this estimate does not take into account that different pile types would be installed on the same day, therefore reducing the total number of pile driving days. Therefore, NMFS expects that the take calculation using the method described above overestimates take. Taking into consideration the number of calendar days, no work occurring on days during the whaling season, construction occurring 6 days per week, there are 123 days in the months of July through October on which the work is expected to occur (75 percent of the 164 days estimated by AGDC). As such, NMFS is proposing to authorize 75 percent of the take estimate calculated by AGDC for each species (except for Level A harassment take of bowhead whales and beluga whales, and Level B harassment of gray whales as noted below).

NMFS recognizes that AGDC may work outside of this period in their February to April contingency period; however, we expect that if AGDC works during the contingency period, it would be because of construction delays (and therefore, days on which they did not work) during their planned open water work season. Additionally, we recognize that ringed seals may be present in ice lairs during the contingency period. However, AGDC must initiate pile driving prior to March 1, as described in the Proposed Mitigation section. Initiating pile driving before March 1 is expected to discourage seals from establishing birthing lairs near pile

driving. As such, we expect that this measure will eliminate the potential for physical injury to ringed seals during this period. Therefore, NMFS expects that the take estimate described herein is reasonable even if AGDC must pile drive during their contingency period.

NMFS calculated take using summer densities for all species except for bowhead whale. For bowhead whales, NMFS conservatively calculated take using the fall density.

TABLE 17—ESTIMATED LEVEL B HARASSMENT TAKES BY SPECIES, PILE SIZE AND TYPE, AND INSTALLATION/REMOVAL METHOD

Activity	Estimated duration (days)	Calculated level B harassment takes					
		Bowhead whale	Gray whale	Beluga whale	Ringed seal	Spotted seal	Bearded seal
DH4							
Sheet Pile	36	41.65	0.08	11.83	668.04	133.61	113.57
Anchor Pile (11.5-inch H-pile)	9	0.06	0	0.02	0.90	0.18	0.15
Mooring Dolphins (48-inch Pipe Pile)	10	2.49	0	0.71	39.98	8.00	6.80
Spud Piles (14-inch H-pile)	12	0.64	0	0.18	10.34	2.07	1.76
South Bridge Abutment							
Dock Face (Sheet Pile)	23	26.61	0.05	7.56	426.80	85.36	72.56
Tailwall (Sheet Pile)	23	26.61	0.05	7.56	426.80	85.36	72.56
Anchor Pile (14-inch H-pile)	1	0.02	0	0.01	0.34	0.07	0.06
North Bridge Abutment							
Dock Face (Sheet Pile)	24	27.76	0.05	7.89	445.36	89.07	75.71
Tailwall (Sheet Pile)	17	19.67	0.04	5.59	315.46	63.09	53.63
Anchor Pile (14-inch H-pile)	1	0.02	0	0.01	0.34	0.07	0.06
Barge Bridge							
Mooring Dolphins (48-inch Pipe Piles)	4	1.00	0	0.28	15.99	3.20	2.72
Spud Piles (14-inch H-piles)	4	0.21	0	0.06	3.45	0.69	0.59
Total	164	146.74	0.27	41.69	2,353.8	470.76	400.15
Level B Harassment Take Proposed for Authorization (75% of Total)	123	110	[a] 2	31	1,765	353	300

[a] 75 percent of the calculated total is 0.2 takes, however, to account for group size (Clarke *et al.,* 2017), NMFS is proposing to authorize two Level B harassment takes of gray whale.

TABLE 18—CALCULATED LEVEL A HARASSMENT TAKES BY SPECIES, PILE SIZE AND TYPE, AND INSTALLATION/REMOVAL METHOD

Activity	Estimated duration (days)	Calculated level B harassment takes					
		Bowhead whale	Gray whale	Beluga whale	Ringed seal	Spotted seal	Bearded seal
DH4							
Sheet Pile	36	0	0	0	0.01	0	0
Anchor Pile (11.5-inch H-pile)	9	0.69	0	0.20	11.05	2.21	1.88
Mooring Dolphins (48-inch Pipe Pile)	10	1.33	0	0.38	21.37	4.27	3.63
Spud Piles (14-inch H-pile)	12	0	0	0	0	0	0
South Bridge Abutment							
Dock Face (Sheet Pile)	23	0	0	0	0.01	0	0
Tailwall (Sheet Pile)	23	0	0	0	0.01	0	0
Anchor Pile (14-inch H-pile)	1	0.05	0	0.02	0.86	0.17	0.15
North Bridge Abutment							
Dock Face (Sheet Pile)	24	0	0	0	0.01	0	0
Tailwall (Sheet Pile)	17	0	0	0	0	0	0
Anchor Pile (14-inch H-pile)	1	0.5	0	0.02	0.86	0.17	0.15
Barge Bridge							
Mooring Dolphins (48-inch Pipe Piles)	4	0.53	0	0.15	8.55	1.71	1.45

TABLE 18—CALCULATED LEVEL A HARASSMENT TAKES BY SPECIES, PILE SIZE AND TYPE, AND INSTALLATION/REMOVAL METHOD—Continued

Activity	Estimated duration (days)	Calculated level B harassment takes					
		Bowhead whale	Gray whale	Beluga whale	Ringed seal	Spotted seal	Bearded seal
Spud Piles (14-inch H-piles)	4	0	0	0	0	0	0
Total	164	2.65	0	0.77	42.73	8.53	7.26
Level A Harassment Take Proposed for Authorization (75% of Total)	123	[a] 0	0	0	32	6	5

[a] 75 percent of the calculated total is 1.99 takes, however, we do not expect bowheads to occur within the Level A harassment zone, and we do not propose to authorize Level A harassment take of bowhead whale.

We do not expect bowheads to occur within the Level A harassment zones due to the shallow waters (approximately 19 ft. in depth at the isopleth). As previously noted, waters less than 15 ft. (4.5 m) deep are considered too shallow to support these whales, and in three decades of aerial surveys by BOEM (ASAMM), no bowhead whale has been recorded in waters less than 16.4 ft (5 m) deep (Clarke and Ferguson 2010). Therefore, we do not expect Level A harassment of bowhead whales to occur, and we do not propose to authorize Level A harassment take of bowheads.

Given the extremely low likelihood of gray whales occurring in the Level A harassment zone (as evidenced by the estimated values in Table 20), we do not expect Level A harassment of gray whales to occur, and do not propose to issue any Level A harassment takes of gray whale.

The largest Level A harassment zone for mid-frequency cetaceans (including the beluga whale) extends 56m from the source during impact driving of the 48-inch pipe piles (Table 10). Considering the small size of the Level A harassment zones, and the low likelihood that a beluga will occur in this area, Level A harassment take is unlikely to occur. Additionally, AGDC is planning to implement a 50m shutdown zone during this activity, which includes the <1 m peak PTS isopleth. We expect shutdown zones will eliminate the potential for Level A harassment take of beluga whale. Therefore, we are not proposing to authorize takes of beluga whale by Level A harassment.

TABLE 19—ESTIMATED TAKE BY LEVEL A AND LEVEL B HARASSMENT, BY SPECIES AND STOCK

Common name	Stock	Level A harassment take	Level B harassment take	Total take	Stock abundance	Percent of stock
Bowhead Whale	Western Arctic	0	110	110	16,820	0.65
Gray Whale	Eastern North Pacific	0	2	2	26,960	0.007
Beluga Whale [a]	Beaufort Sea	0	31	31	39,258	0.08
	Chukchi Sea				20,752	0.15
Ringed Seal	Alaska	32	1,765	1,797	N/A	N/A
Spotted Seal	Alaska	6	353	359	461,625	0.08
Bearded Seal	Alaska	5	300	305	N/A	N/A

[a] As noted in the Description of Marine Mammals in the Area of Specified Activities section, beluga whales in the project area are likely to be from the Beaufort Sea stock. However, we have conservatively attributed all takes to each stock in our analysis.

Effects of Specified Activities on Subsistence Uses of Marine Mammals

The availability of the affected marine mammal stocks or species for subsistence uses may be impacted by this activity. The subsistence uses that may be affected and the potential impacts of the activity on those uses are described below. Measures included in this IHA to reduce the impacts of the activity on subsistence uses are described in the Proposed Mitigation section. Last, the information from this section and the Proposed Mitigation section is analyzed to determine whether the necessary findings may be made in the Unmitigable Adverse Impact Analysis and Determination section.

The communities of Nuiqsut, Utqiaġvik and Kaktovik engage in subsistence harvests off the North Slope of Alaska. Alaska Native communities have harvested bowhead whales for subsistence and cultural purposes with oversight and quotas regulated by the International Whaling Commission (IWC). The North Slope Borough (NSB) Department of Wildlife Management has been conducting bowhead whale subsistence harvest research since the early 1980's to collect the data needed by the IWC to set harvest quotas. Bowhead whale harvest (percent of total marine mammal harvest), harvest weight, and percent of households using bowhead whale are presented in Table 25 of AGDC's application.

Most of the Beaufort Sea population of beluga whales migrate from the Bering Sea into the Beaufort Sea in April or May. The spring migration routes through ice leads are similar to those of the bowhead whale. Fall migration through the western Beaufort Sea is in September or October. Surveys of the fall distribution strongly indicate that most belugas migrate offshore along the pack ice front beyond the reach of subsistence harvesters. Beluga whales are harvested opportunistically during the bowhead harvest and throughout ice-free months. No beluga whale harvests were reported in 2006 survey interviews conducted by SRBA in any community (SRBA 2010). Beluga harvests were also not reported in Nuiqsut and Kaktovik, although

households did report using beluga whale, likely through sharing from other communities (Brown *et al.,* 2016). We do not expect the proposed activities at the Alaska LNG project site to affect beluga whale subsistence harvests, as none are expected.

Gray whale harvests were not reported by any of the communities surveyed by Alaska Department of Fish and Game (ADF&G) in any of the survey years, and therefore are not included as an important subsistence species and are not further discussed.

The community of Utqiaġvik's subsistence activities occur outside of the area impacted by activities considered in this authorization, and are not discussed further. Please refer to AGDC's application for additional information on Utqiaġvik's subsistence activities.

Kaktovik

Kaktovik is the easternmost village in the NSB. Kaktovik is located on the north shore of Barter Island, situated between the Okpilak and Jago rivers on the Beaufort Sea coast. Kaktovik's subsistence-harvest areas are to the east of the project area and target marine mammal species migrating eastward during spring and summer occur seaward of the project area and westward in the fall.

Kaktovik bowhead whale hunters reported traveling between Camden Bay to the west and Nuvagapak Lagoon to the east (SRBA 2010). This range does not include the project area impacted by the activities analyzed for this proposed IHA, therefore, Kaktovik bowhead whale hunting is not discussed further. Please refer to AGDC's application for additional information.

Ringed, spotted and bearded seals are harvested by the community of Kaktovik. Residents hunt seals in rivers during ice-free months, primarily July–August. Ringed seals are an important subsistence resource for Native Alaskans living in communities along the Beaufort Sea coast. Kaktovik hunters travel by boat to look for ringed seals on floating ice (often while also hunting for bearded seal) or sometimes along the ice edge by snow machine before break-up, during the spring (SRBA 2010). In 2006, 7 people (18 percent of survey respondents) indicated that they had recently hunted for ringed seals in Kaktovik (SRBA 2010). Residents reported looking for ringed seal, usually while also searching for bearded seal, offshore between Prudhoe Bay to the west and Demarcation Bay to the east (SRBA 2010). Ringed seal hunting typically peaks between March and August but continues into September, as well (SRBA 2010). Although residents reported hunting ringed seals up to approximately 30 mi (48 km) from shore, the highest numbers of overlapping use areas generally occur within a few miles from shore (SRBA 2010). The total use area for ringed seal from 1995–2006 encompassed approximately 2,139 mi^2. Harvest of ringed seals by Kaktovik hunters does not typically occur to the west of Camden Bay and therefore is not expected to be affected by Alaska LNG project activities.

Kaktovik hunters harvested 126 pounds of spotted seals in 1992 (ADF&G CSIS; retrieved and analyzed August 15, 2018). Spotted seals were not reported harvested in 2006 survey interviews conducted in Nuiqsut (SRBA 2010).

Kaktovik bearded seal hunting occurs along the coast as far west as Prudhoe Bay and as far east as the United States/Canada border (SRBA 2010). Residents reported looking for bearded seal as far as approximately 30 mi (48 km) from shore, but generally hunt them closer to shore, up to 5 mi (8 km; SRBA 2010). Between 1994–2003, 29 bearded seals were taken in Kaktovik. In 2006, 7 people (18 percent of survey respondents) indicated that they had recently hunted for bearded seals in Kaktovik (SRBA 2010). Bearded seal hunting activities, like ringed seal, begin in March, peaking in July and August, and then conclude in September (SRBA 2010).

The community of Kaktovik is approximately 100 (direct) mi (160 km) from the proposed project at Prudhoe Bay; subsistence activities for these communities primarily occur outside of the project construction area and associated Level A and Level B harassment zones. The planned construction and use of improvements to West Dock would occur in Prudhoe Bay, adjacent to existing oil and gas infrastructures, and in an area that is not typically used for subsistence other than extremely limited bearded seal hunting by residents of Kaktovik.

Because of the distance from Kaktovik and Kaktovik's very limited use of waters offshore of Prudhoe Bay, and because the proposed activities would occur in an already-developed area, it is unlikely that the proposed activities would have any effects on the use of marine mammals for subsistence by residents of Kaktovik. Therefore, we do not discuss Kaktovik's subsistence activities further.

Nuiqsut

The proposed construction activities would occur closest to the marine subsistence use area used by the Native Village of Nuiqsut. Nuiqsut is located on the west bank of the Nechelik Channel on the lower Colville River, about 25 mi (40 km) from the Arctic Ocean and approximately 150 mi (242 km) southeast of Utqiaġvik. Nuiqsut subsistence hunters utilize an extensive search area, spanning 16,322 mi^2 (km^2) across the central Arctic Slope (see Figure 19 of AGDC's application, Brown *et al.,* 2016). Marine mammal hunting is primarily concentrated in two areas: (1) Harrison Bay, between Atigaru Point and Oliktok Point, including a northward extent of approximately 50 mi (80 km) beyond the Colville River Delta (Brown *et al.,* 2016); and (2) east of the Colville River Delta between Prudhoe and Foggy Island bays, which includes an area of approximately 100 square mi surrounding the Midway Islands, McClure Island and Cross Island (Brown *et al.,* 2016). The community of Nuiqsut uses subsistence-harvest areas adjacent to the proposed construction area; however, West Dock is not a common hunting area, nor is it visited regularly by Nuiqsut subsistence hunters primarily because of its industrial history.

Ringed, spotted and bearded seals are also harvested by the community of Nuiqsut. Seal hunting typically begins in April and May with the onset of warmer temperatures. Many residents continue to hunt seals after spring breakup as well (Brown *et al.,* 2016).

The most important seal hunting area for Nuiqsut hunters is off the Colville Delta, an area extending as far west as Fish Creek and as far east as Pingok Island. Seal hunting search areas by Nuiqsut hunters also included Harrison Bay, and a 30-mi (48-km) stretch northeast of Nuiqsut between the Colville and Kuparuk rivers, near Simpson Lagoon and Jones Islands (Brown *et al.,* 2016). Cross Island is a productive area for seals, but is too far from Nuiqsut to be used on a regular basis. Seal subsistence use areas of Nuiqsut from 1995 through 2006 are depicted in Figure 21 of AGDC's application.

Ringed seals are an important subsistence resource for Native Alaskans living in communities along the Beaufort Sea coast. Nuiqsut residents commonly harvest ringed seal in the Beaufort Sea during the summer months (SRBA 2010). There are a higher number of use areas extending east and west of the Colville River delta. Residents reported traveling as far as Cape Halkett to the west and Camden Bay to the east in search of ringed seal. Survey respondents reported traveling offshore up to 30 mi (48 km; SRBA 2010). Residents reported hunting

ringed seals throughout the late spring, summer, and early fall with a higher number of use areas reported in June, July, and August (SRBA 2010). In 2006, 12 people (36 percent of survey respondents) indicated that they had recently hunted for ringed seals in Nuiqsut (SRBA 2010).

Nuiqsut bearded seal use areas extend as far west as Cape Halkett, as far east as Camden Bay, and offshore up to 40 mi (64 km). In 2006, 12 people (69 percent of survey respondents) indicated that they had recently hunted for bearded seals in Nuiqsut (SRBA 2010). Nuiqsut hunters reported hunting bearded seal during the summer season in open water as the seals are following the ice pack. Residents reported hunting bearded seal between June and September, although a small number of use areas were reportedly used in May and October (SRBA 2010). The number of reported bearded seal use areas peak in July and August, when the majority of seals are available along the ice pack (SRBA 2010).

Nuiqsut's bowhead whale hunt occurs in the fall at Cross Island, a barrier island located approximately 12 mi (19 km) northwest of West Dock. Nuiqsut whalers base their activities from Cross Island (Galginaitis 2014), and the whaling search and the harvest areas typically are concentrated north of the island. Hunting activities between 1997 and 2006 occurred almost as far west as Thetis Island, as far east as Barter Island (Kaktovik), and up to approximately 50 mi (80 km) offshore (SRBA 2010). Harvest locations in 1973–2011 and GPS tracks of 2001–2011 whaling efforts are shown in Figure 19 of AGDC's application.

Bowhead whales are harvested by Nuiqsut whalers during the fall whaling season. Nuiqsut residents typically hunt bowhead whales in September, although a small number of use areas were reported in August and extending into October (Stephen R. Braund & Associates [SRBA] 2010). Pile driving will not occur during Nuiqsut whaling.

Nuiqsut subsistence hunting crews operating from Cross Island have harvested three to four bowhead whales per year (Bacon *et al.,* 2009; Galginaitis 2014). In 2014, the Alaska Eskimo Whaling Commission (AEWC) allocated Nuiqsut a quota of four bowhead whales each year; however, through transfers of quota from other communities, in 2015 Nuiqsut was able to harvest five whales (Brown *et al.,* 2016). In 2006, 10 people (30 percent of survey respondents) in Nuiqsut indicated that they had recently hunted for bowhead whales (SRBA 2010). In 2016, Nuiqsut whaling crews harvested four bowhead whales (Suydam *et al.,* 2017).

Nuiqsut is 70 mi (112 km) away from the proposed project, and is likely to be the community that has the greatest potential to experience any impacts to subsistence practices. The primary potential for AK LNG project impacts to Nuiqsut's subsistence use of marine mammals is associated with barge activity, which could interfere with summer seal and fall bowhead whale hunting (Alaska LNG 2016). Barge activity is beyond the scope of this IHA, but noise associated with barging could deflect bowhead whales as they migrate through Nuiqsut's fall whaling grounds or cause temporary disturbances of seals, making successful harvests more difficult. Barge traffic would occur from July through September. Although barging activities would not cease during Nuiqsut's fall bowhead whale hunting activities, the potential for impact would be greatly reduced by keeping project vessels landward of Cross Island during the August 25–September 15 period, avoiding the high use areas offshore of the island during the entire whaling season in most years (Alaska LNG 2016, 2017).

Pile driving associated with construction at West Dock could also affect subsistence hunting of bowhead whales, as the Level B harassment zones extend up to 4.6 km from the pile driving site for some pile and hammer type combinations. As such, AGDC will not pile drive during the Nuiqsut whaling season (see Proposed Mitigation). AGDC has consulted with AEWC and NSB on mitigation measures to limit impacts (Alaska LNG 2016), and has continued to provide formal and informal project updates to these groups, as recently as February 2020 and May 2020.

The planned activities are not expected to impact marine mammals in numbers or locations sufficient to render them unavailable for subsistence harvest given the short-term, temporary, and localized nature of construction activities, and the proposed mitigation measures. Impacts to marine mammals would mostly include limited, temporary behavioral disturbances of seals, however, some PTS is possible. Serious injury or mortality of marine mammals is not anticipated from the proposed activities, and the activities are not expected to have any impacts on reproductive or survival rates of any marine mammal species.

In summary, impacts to subsistence hunting are not expected due to the distance between West Dock construction and primary seal hunting areas, and proposed mitigation during the Nuiqsut bowhead whale hunt.

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 the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses. 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 the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

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

Mitigation for Marine Mammals and Their Habitat

In addition to the measures described later in this section, AGDC will employ the following mitigation measures:

- Conduct briefings between construction supervisors and crews and the marine mammal monitoring team prior to the start of all pile driving

activity and when new personnel join the work, to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures;

• For in-water heavy machinery work other than pile driving, if a marine mammal comes within 10 m, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions;

• For those marine mammals for which Level B harassment take has not been requested, in-water pile installation/removal will shut down immediately when it is safe to do so if such species are observed within or entering the Level B harassment zone; and

• If take reaches the authorized limit for an authorized species, pile installation will be stopped as these species approach the Level B harassment zone to avoid additional take.

TABLE 20—SHUTDOWN ZONES DURING PILE INSTALLATION AND REMOVAL

Activity	Hammer type	Shutdown zone (m)		
		LF cetaceans	MF cetaceans	Phocids
11.5-inch H-Pile	Impact	1,200	50	500
14-inch H-Pile	Impact	1,200	50	500
	Vibratory	10	10	10
48-inch Pipe Pile	Impact	1,600	50	500
Sheet Piles	Vibratory	20	10	10

AGDC is required to implement all mitigation measures described in the biological opinion (issued on June 3, 2020).

The following mitigation measures would apply to AGDC's in-water construction activities.

Establishment of Shutdown Zones—AGDC will establish shutdown zones for all pile driving and removal activities. The purpose of a shutdown zone is generally to define an area within which shutdown of the activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). Shutdown zones will vary based on the activity type and marine mammal hearing group (see Table 20). The largest shutdown zones are generally for low frequency cetaceans as shown in Table 20. In this instance, the largest shutdown zone for low frequency cetaceans is 1,600 m. AGDC expects that they will be able to effectively observe phocids at distances up to 500 m, large cetaceans at 2–4 km, and belugas at 2–3 km.

The placement of protected species observers (PSOs) during all pile driving and removal activities (described in detail in the Proposed Monitoring and Reporting section) will ensure that the entire shutdown zone is visible during pile installation. If visibility degrades to where the PSO determines that they cannot effectively monitor the entire shutdown zone during pile driving, the applicant may continue to drive the pile section that was being driven to its target depth when visibility degraded to unobservable conditions, but will not drive additional sections of pile. Pile driving may continue during low light conditions to allow for the evaluation of night vision and infrared sensing devices.

Monitoring for Level A and Level B Harassment—AGDC will monitor the Level B harassment zones (areas where SPLs are equal to or exceed the 160 dB rms threshold for impact driving and the 120 dB rms threshold during vibratory driving) and Level A harassment zones, to the extent practicable. 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 shutdown of activity should the animal enter the shutdown zone. Placement of PSOs on elevated structures on West Dock will allow PSOs to observe phocids within the Level A and Level B harassment zones, to an estimated distance of 500 m. However, due to the large Level A and Level B harassment zones (Table 10), PSOs will not be able to effectively observe the entire zones during all activities. Therefore, marine mammal exposures will be recorded and extrapolated based upon the number of observed exposures and the percentage of the Level A or Level B harassment zone that was not visible.

Pre-activity Monitoring—Prior to the start of daily in-water construction activity, or whenever a break in pile driving or removal of 30 minutes or longer occurs, PSOs will observe the shutdown and monitoring zones for a period of 30 minutes. If a marine mammal is observed within the shutdown zone, a soft-start cannot proceed until the animal has left the zone or has not been observed for 15 minutes (pinnipeds) or 30 minutes (cetaceans). When a marine mammal for which Level B harassment take is authorized is present in the Level B harassment zone, activities may begin and Level B harassment take will be recorded. If the entire Level B harassment zone is not visible at the start of construction pile driving or removal activities can begin. If work ceases for more than 30 minutes, the pre-activity monitoring of both the Level B harassment zone and shutdown zones will commence.

Nighttime Monitoring—PSOs will use night vision devices (NVDs) and infrared (IR) for nighttime and low visibility monitoring. AGDC will select devices for monitoring, and will test the devices to determine the efficacy of the monitoring equipment and technique. For a detailed explanation of AGDC's plan to test the NVDs and IR equipment, please see AGDC's 4MP, available online at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable* (Please note that AGDC will not assess object detection at distance intervals using buoys as stated in the 4MP. Rather, they will test object detection on land using existing landmarks at known distances from PSOs, such as road signs.)

Soft Start—Soft-start procedures are believed to provide additional protection to marine mammals by providing warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. For impact pile driving, contractors will be required to provide an initial set of three strikes from the hammer at reduced energy, followed by a 30-second waiting period. This procedure will be conducted three times before impact pile driving begins. Soft

start will be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer.

Pile Driving During Contingency Period—In the event that AGDC must continue pile driving or removal during their contingency period (February–April 2023), AGDC must begin pile driving before March 1, the known onset of ice seal lairing season. Initiating pile driving before March 1 is expected to discourage seals from establishing birthing lairs near pile driving. Additionally, a subsistence advisor would survey areas within a buffer zone of DH4 where water depth is greater than 10 ft. (3 m) to identify potential ringed seal structures before activity begins. Construction crews would avoid identified ice seal structures by a minimum of 500 ft. (150 m).

AGDC does not plan to use a bubble curtain or other sound attenuation device. Given the shallow water in the project area, bubble curtains would be very difficult to deploy, and may not result in significant sound reduction.

Mitigation for Subsistence Uses of Marine Mammals or Plan of Cooperation

Regulations at 50 CFR 216.104(a)(12) further require IHA applicants conducting activities in or near a traditional Arctic subsistence hunting area and/or that may affect the availability of a species or stock of marine mammals for Arctic subsistence uses to provide a Plan of Cooperation or information that identifies what measures have been taken and/or will be taken to minimize adverse effects on the availability of marine mammals for subsistence purposes. A plan must include the following:

- A statement that the applicant has notified and provided the affected subsistence community with a draft plan of cooperation;
- A schedule for meeting with the affected subsistence communities to discuss proposed activities and to resolve potential conflicts regarding any aspects of either the operation or the plan of cooperation;
- A description of what measures the applicant has taken and/or will take to ensure that proposed activities will not interfere with subsistence whaling or sealing; and
- What plans the applicant has to continue to meet with the affected communities, both prior to and while conducting the activity, to resolve conflicts and to notify the communities of any changes in the operation.

AGDC provided a draft Plan of Cooperation (POC) to NMFS on March 27, 2019. The POC outlines AGDC's extensive coordination with subsistence communities that may be affected by the AK LNG project. It includes a description of the project, community outreach that has already been conducted, and project mitigation measures. AGDC will continue coordination with subsistence communities throughout the project duration. The POC is a live document and will be updated throughout the project review and permitting process. AGDC's draft POC is available on our website at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection*-act.

AGDC continues to document its communications with the North Slope subsistence communities, as well as the substance of its communications with subsistence stakeholder groups, and has developed mitigation measures that include measures suggested by community members as well as industry standard measures. AGDC will continue to routinely engage with local communities and subsistence groups. Multiple user groups are often consulted simultaneously as part of larger coalition meetings such as the Arctic Safety Waterways Committee meetings. Local communities and subsistence groups identified by AGDC are listed in the POC. AGDC will develop a Communication Plan and will implement this plan before initiating construction operations to coordinate activities with local subsistence users, as well as Village Whaling Captains' Associations, to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale hunt and other subsistence hunts. A project informational mailer with a request for community feedback (traditional mail, email, phone) will be sent to community members prior to construction. Following the construction season, AGDC intends to have a post-season co-management meeting with the commissioners and committee heads to discuss results of mitigation measures and outcomes of the preceding season. The goal of the post-season meeting is to build upon the knowledge base, discuss successful or unsuccessful outcomes of mitigation measures, and possibly refine plans or mitigation measures if necessary.

The AEWC works annually with industry partners to develop a Conflict Avoidance Agreement (CAA). This agreement implements mitigation measures that allow industry to conduct their work in or transiting the vicinity of active subsistence hunters, in areas where subsistence hunters anticipate hunting, or in areas that are in sufficient proximity to areas expected to be used for subsistence hunting where the planned activities could potentially adversely affect the subsistence bowhead whale hunt through effects on bowhead whales, while maintaining the availability of bowheads for subsistence hunters. One key aspect of the CAA is the inclusion of time and area closures. AGDC is considering whether it would enter into a CAA or similar agreement with the AEWC and will discuss and evaluate a CAA in the aforementioned meetings.

AGDC will not conduct pile driving during the Nuiqsut whaling season in an effort to eliminate effects on the availability of bowhead whales for subsistence hunting that could occur as a result of project noise. Nuiqsut whaling is approximately August 25–September 15, though the exact dates may change.

Barging activities could potentially impact Nuiqsut's fall bowhead whale hunt and possibly other marine mammal harvest activities in the Beaufort Sea. As mentioned previously, barging activities are beyond the scope of this IHA, and no take is expected to occur as a result of barging activities. However, NMFS notes that AGDC will limit barges to waters shoreward of Cross Island during the Nuiqsut whaling season (approximately August 25–September 15) in an effort to avoid any potential impacts on subsistence uses. AGDC has consulted with AEWC and NSB on mitigation measures to limit impacts (Alaska LNG 2016), and has continued to provide formal and informal project updates to these groups, as recently as February 2020 and May 2020. As noted previously, AGDC's construction activities at West Dock do not overlap with the areas where subsistence hunters typically harvest ice seals, therefore, these activities are not expected to impact subsistence hunts of ice seals.

Based on our evaluation of the applicant's proposed measures, as well as other measures considered by NMFS, NMFS has preliminarily determined that the proposed mitigation measures provide the means 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, and on the availability of such species or stock for subsistence uses.

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

Marine mammal monitoring must be conducted in accordance with the Marine Mammal Monitoring Plan, available online at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable.* Marine mammal monitoring during pile driving and removal must be conducted by NMFS-approved PSOs in a manner consistent with the following:

- Independent PSOs (*i.e.,* not construction personnel) who have no other assigned tasks during monitoring periods must be used;
- 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;
- Other PSOs may substitute education (degree in biological science or related field) or training for experience. PSOs may also substitute Alaska native traditional knowledge for experience. (NMFS recognizes that PSOs with traditional knowledge may also have prior experience, and therefore be eligible to serve as the lead PSO.); and
- AGDC must submit PSO CVs for approval by NMFS prior to the onset of pile driving.

PSOs should 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; and
- 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.

At least two PSOs will be present during all pile driving/removal activities. PSOs will have an unobstructed view of all water within the shutdown zone. PSOs will observe as much of the Level A and Level B harassment zone as possible. PSO locations are as follows:

i. Dock Head 4—During impact pile driving at DH4, two PSOs must be stationed to view toward the east, north, and west of the seawater treatment plant. During vibratory pile driving at DH4, two PSOs must monitor from each PSO location (four PSOs); and

ii. Barge Bridge—During work at the barge bridge, two PSOs must be stationed at the north end of the bridge.

PSOs will be stationed on elevated platforms at DH4, and on the elevated bridge during work at the barge bridge. They will possess the equipment described in the 4MP, including NVDs during nighttime monitoring. However, during the primary construction season, nighttime on the North Slope will be brief. Given the elevated PSO sites and equipment, AGDC expects that they will be able to effectively observe phocids at distances up to 500 m, large cetaceans at 2–4 km, and belugas at 2–3 km, however, PSOs will not be able to effectively observe the entire area of the Level A (seals only) or Level B harassment zones during all pile driving activities.

PSOs will begin monitoring three days prior to the onset of pile driving and removal activities and continue through three days after completion of the pile driving and removal activities. PSOs will monitor 24 hours per day, even during periods when construction is not occurring. In addition, observers shall record all incidents of marine mammal occurrence, regardless of distance from activity, and shall document any behavioral reactions in concert with distance from piles being driven or removed. Pile driving activities include the time to install or remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes.

Acoustic Monitoring

AGDC will deploy a single, archival passive acoustic monitoring (PAM) receiver in the far field to collect data that indicates the gross presence of marine mammals and the received sound source level at distance during construction.

Reporting

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

- Dates and times (begin and end) of all marine mammal monitoring;
- Construction activities occurring during each daily observation period, including precise start and stop time of

each type of construction operation mode, how many and what type of piles were driven or removed and by what method (*i.e.,* impact or vibratory);

- Total number of hours during which each construction activity type occurred.
- Total number of hours that PSOs were on duty during each construction activity, and total number of hours that PSOs were on duty during periods of no construction activity;
- Weather parameters and water conditions during each monitoring period (*e.g.,* wind speed, percent cover, visibility, sea state), and number of hours of observation that occurred during various visibility and sea state conditions.
- The number of marine mammals observed, by species and operation mode, relative to the pile location;
- The number of marine mammals observed (including periods with no construction).
- Distances and bearings of each marine mammal observed to the pile being driven or removed for each sighting (if pile driving or removal was occurring at time of sighting).
- Age and sex class, if possible, of all marine mammals observed;
- PSO locations during marine mammal monitoring, including elevation above sea level;
- Distances and bearings of each marine mammal observed to the pile being driven or removed for each sighting (if pile driving or removal was occurring at time of sighting);
- Description of any marine mammal behavior patterns during observation, including direction of travel and estimated time spent within the Level A and Level B harassment zones while the source was active;
- Number of individuals of each species (differentiated by month as appropriate) detected within the monitoring zone, and estimates of number of marine mammals taken, by species (a correction factor may be applied to total take numbers, as appropriate);
- Histograms of perpendicular distances to PSO sightings, by species (or species group if sample sizes are small);
- Sighting rates summarized into daily or weekly periods for the before, during, and after construction periods;
- Maps showing visual and acoustic detections by species and construction activity type.
- Detailed information about any implementation of any mitigation triggered (*e.g.,* shutdowns and delays), a description of specific actions that ensued, and resulting behavior of the animal, if any;
- Description of attempts to distinguish between the number of individual animals taken and the number of incidences of take, such as ability to track groups or individuals;
- An extrapolation of the estimated takes by Level A and Level B harassment based on the number of observed exposures within the Level A and Level B harassment zone and the percentages of the Level A and Level B harassment zones that were not visible; and
- Submit all PSO datasheets and/or raw sighting data (in a separate file from the Final Report referenced immediately above).

If no comments are received from NMFS within 30 days, the draft 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.

AGDC's acoustic monitoring report must include the number of marine mammal detections (including species, date and time of detection, and type of pile driving underway, if applicable), the received sound levels from pile driving activity, and the following hydrophone equipment and method information: Recording devices, sampling rate, sensitivity of the PAM equipment, locations of the hydrophones, duty cycle, distance (m) from the pile where recordings were made, depth of recording devices, depth of water in area of recording devices.

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the IHA-holder shall report the incident to the Office of Protected Resources (OPR) (301–427–8401), NMFS and to the Alaska regional stranding coordinator (907–586–7209) as soon as feasible. If the death or injury was clearly caused by the specified activity, the IHA-holder must immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the IHA. The IHA-holder must not resume their activities until notified by NMFS.

The report must include the following information:

- Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
- Species identification (if known) or description of the animal(s) involved;
- Condition of the animal(s) (including carcass condition if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- If available, photographs or video footage of the animal(s); and
- General circumstances under which the animal was discovered.

Monitoring Plan Peer Review

The MMPA requires that monitoring plans be independently peer reviewed where the proposed activity may affect the availability of a species or stock for taking for subsistence uses (16 U.S.C. 1371(a)(5)(D)(ii)(III)). Regarding this requirement, NMFS' implementing regulations state that upon receipt of a complete monitoring plan, and at its discretion, NMFS will either submit the plan to members of a peer review panel for review or within 60 days of receipt of the proposed monitoring plan, schedule a workshop to review the plan (50 CFR 216.108(d)).

NMFS established an independent peer review panel to review AGDC's Monitoring Plan for the proposed project in Prudhoe Bay. NMFS provided AGDC's monitoring plan to the Peer Review Panel (PRP) and asked them to answer the following questions:

1. Will the applicant's stated objectives effectively further the understanding of the impacts of their activities on marine mammals and otherwise accomplish the goals stated below? If not, how should the objectives be modified to better accomplish the goals below?
2. Can the applicant achieve the stated objectives based on the methods described in the plan?
3. Are there technical modifications to the proposed monitoring techniques and methodologies proposed by the applicant that should be considered to better accomplish the objectives?
4. Are there techniques not proposed by the applicant (*i.e.,* additional monitoring techniques or methodologies) that should be considered for inclusion in the applicant's monitoring program to better accomplish the objectives?
5. What is the best way for an applicant to present their data and results (formatting, metrics, graphics, etc.) in the required reports that are to be submitted to NMFS (*i.e.,* 90-day report)?

The peer review panel (PRP) met in March 2020 and subsequently provided a final report to NMFS containing recommendations that the panel members felt were applicable to AGDC's monitoring plan. The panel concluded that the objectives are appropriate,

however they provided some recommendations to improve AGDC's ability to achieve their stated objectives. The PRP's primary recommendations and comments are summarized and addressed below. The PRP's full report is available on our website at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.*

The PRP recommended that AGDC station PSOs on elevated platforms to increase sighting distance. NMFS agrees and proposes to require AGDC to provide elevated monitoring locations for PSOs. The structures would vary depending on the construction location.

The PRP recommended that PSOs focus on scanning the shoreline and water, alternately with visual scans and using binoculars, to detect as many animals as possible rather than following individual animals for any length of time to collect detailed behavioral information. NMFS requires PSOs to document and report the behavior of marine mammals observed within the Level A and Level B harassment zones. While NMFS agrees that PSOs should not document behavior at the expense of detecting other marine mammals, particularly within the shutdown zone, we are asking PSOs to record an estimate of the amount of time that an animal spends in the harassment zone, which is important to help understand the likelihood of incurring PTS (given the duration component of the thresholds) and the severity of behavioral disturbance.

The PRP recommended that the PSOs record visibility conditions at regular intervals (*e.g.,* every five minutes) and as they change throughout the day. The panel recommended using either laser range finders or a series of ''landmarks'' at varying distances from each observer. The PRP notes that if AGDC uses landmarks, AGDC could measure the distance to the landmarks on the ground before pile driving or removal begins, and reference these landmarks throughout the season to record visibility. The landmarks could be buildings, signs, or other stationary objects on land that are located at increasing distances from each observation platform. PSOs should record visibility according to the farthest landmark the laser range finder can detect or that the PSO can clearly see. NMFS will require AGDC to record visibility conditions throughout construction; however, NMFS will require PSOs to record visibility every 30 minutes, rather than every five minutes, in an effort to minimize distraction from observing marine mammals. PSOs will be equipped with range finders, and will establish reference landmarks on land.

The PRP recommended that AGDC have a designated person on site keeping an activity log that includes the precise start and stop dates and times of each type of construction operation mode. AGDC's field lead PSO will record this information during construction.

The PRP commended AGDC's proposed use and experimentation with night vision devices (NVD) and infrared technology. The panel noted that there are many devices with a broad range of capabilities that should be thoroughly understood before the experiment is conducted. AGDC will select the most effective devices based on surveys of experienced PSOs and literature provided by the panel.

The PRP expressed concern about the limited effective visual detection range of the PSOs in comparison with the estimated size of the Level A and Level B harassment zones, including AGDC's ability to shut down at the proposed distances, and AGDC's ability to estimate actual Level A and Level B harassment takes. The panel noted that effective sighting distances are likely 200 m for seals, and 1 km for mysticetes, based on ship-based PSO observations in the Chukchi Sea (LGL *et al.,* 2011). They noted that the effective sighting distance for beluga whales may be greater than 200 m, although visibility would likely decrease in windy conditions with white caps (DeMaster *et al.,* 2001). The panel recommended that AGDC implement real-time PAM to verify the harassment zone sizes, and to improve detection of marine mammals at distances where visual detection probability is limited or not possible. The panel recommended that AGDC begin PAM two to three weeks prior to the start of construction and continue through two to three weeks after construction activities conclude for the season. They recommended archival bottom mounted recorders as an alternative to real-time PAM, but noted that these setups are not as easy to relocate and that data can only be accessed after recovery.

In a related comment, the panel recommended that AGDC report total estimated Level A and Level B harassment takes using two methods. First, the panel recommended that AGDC assume that animal density is uniform throughout the Level B harassment zone and use distance sampling methods, such as Burt *et al.,* 2014, based only on the shore-based PSO observations to estimate actual takes by Level B harassment. Second, the PRP recommended that AGDC also use real-time PAM to estimate takes by Level B harassment only in the far field, assuming that each acoustic detection that occurs during pile driving or removal is a Level B harassment take.

In consideration of the effective sighting distances included in the PRP report, and estimated effective sighting distances from the applicant, NMFS has decreased the planned shutdown zone for phocids during impact pile driving to 500 m, as proposed herein. While this distance is greater than the 200 m estimated by the PRP, shore-based PSOs typically have greater visibility. Additionally, AGDC's PSOs will observe from elevated locations.

NMFS does not propose to require AGDC to report Level A and Level B harassment takes using distance sampling methods, as NMFS does not believe that it is appropriate to apply precise distance sampling methods intended for systematic surveys to estimating take numbers in this situation. As noted by the panel, the assumption of uniform density throughout the Level A and Level B harassment zone is likely violated in this instance, and the pile driving and removal activities are likely to further affect the distribution within the zones. Therefore, NMFS proposes to require AGDC to include an extrapolation of the estimated takes by Level A and Level B harassment based on the number of observed exposures within the Level A or Level B harassment zone and the percentage of the Level A or Level B harassment zone that was not visible in their final report.

NMFS does not propose to require AGDC to implement real-time PAM. However, NMFS proposes to require AGDC to include a single, archival PAM receiver in the far field to collect data that indicates the gross presence of marine mammals and the received sound source level at distance. AGDC will implement the majority, if not all, of the proposed pile driving and removal during the open water season. Since AGDC would need to deploy the PAM system after ice melt, deploying it two to three weeks before and after the construction period would narrow AGDC's open water work window by at least one month. Additionally, while AGDC's construction is occurring within a limited timeframe, other companies have operations in the area also, which may interfere with the ability to gather baseline data regarding marine mammal presence without interference from other industrial activities. Marine mammals in the project area are migratory, so presence within the work area would change

throughout the suggested monitoring period, even if AGDC was not conducting the activity. As such, NMFS will require AGDC to deploy the archival PAM receiver for the duration of the active construction period only.

We do not expect marine mammals within the project area to be particularly vocal, given that the project is primarily during the open water season, outside of the breeding period. The operation of real-time PAM is significantly more costly than collecting PAM data for later analyses, as someone would need to monitor the data in real-time, and the PAM buoys would need to be relocated for changes in monitoring zone sizes between various pile sizes and installation or removal methods. Real-time PAM would be helpful if there were a necessity to take an action, such as shutting down operations, at the time that a detection occurs. However, in this instance, visual monitoring by PSOs can adequately minimize Level A harassment take, and the proposed authorization includes Level A harassment take of ice seals. Given the limitations described above, implementation of real-time PAM is not warranted in light of the associated cost and effort.

The PRP also recommended that PSOs observations begin 2–3 weeks prior to construction, continue through the construction season, and continue for 2–3 weeks after the construction season ends. Given that ice conditions in the weeks leading up to the construction period will differ from that during construction (as will ice seal presence), NMFS will require PSOs to observe from shore during the three days before construction begins, and for three additional days after the construction season ends, rather than 2–3 weeks. During the construction season, NMFS will require PSOs to monitor 24 hours per day, even during periods without construction.

The PRP also made recommendations regarding how AGDC should present their monitoring data and results. Please refer to part V of the report for those suggestions. AGDC will implement the reporting recommendations that do not require PAM as stated in the recommendations. NMFS is still considering whether reporting recommendations h-j are appropriate.

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).

To avoid repetition, the majority of our analyses apply to all of the species listed in Table 19, given that many of the anticipated effects of this project on different marine mammal stocks are expected to be relatively similar in nature. Where there are meaningful differences between species or stocks in anticipated individual responses to activities, impact of expected take on the population due to differences in population status or impacts on habitat, they are described independently in the analysis below.

Pile driving and removal activities associated with the project, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level A and Level B harassment, from underwater sounds generated from pile driving and removal. Potential takes could occur if individuals of these species are present in zones ensonified above the thresholds for Level A or Level B harassment, identified above, when these activities are underway. While AGDC may pile drive at any time of day (24 hours per day), we do not expect noise-producing pile driving will actually occur at all times during a 24-hour period, given the general construction process, including time for setting up piles pile for installation.

The takes from Level A and Level B harassment will be due to potential behavioral disturbance, TTS and PTS. No mortality or serious injury is anticipated given the nature of the activity. Level A harassment is only anticipated for ringed seal, spotted seal, and bearded seal. The potential for Level A harassment is minimized through the construction method and the implementation of the required mitigation measures (see Proposed Mitigation section).

Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.,* Thorson and Reyff 2006; HDR, Inc. 2012; Lerma 2014; ABR 2016). Most likely for pile driving, individuals will simply move away from the sound source and be temporarily displaced from the areas of pile driving, although even this reaction has been observed primarily only in association with impact pile driving, which is just a portion of AGDC's construction. Level B harassment will be reduced to the level of least practicable adverse impact through use of mitigation measures described herein. If sound produced by project activities is sufficiently disturbing, animals are likely to simply avoid the area while the activity is occurring. While vibratory driving associated with the project may produce sound at distances of many kilometers from the project site, the project site itself is located in an active industrial area, as previously described. Therefore, we expect that animals annoyed by project sound will simply avoid the area and use more-preferred habitats.

In addition to the expected effects resulting from authorized Level B harassment, we anticipate that ringed seals, spotted seals, and bearded seals may sustain some limited Level A harassment in the form of auditory injury. However, animals that experience PTS will likely only receive slight PTS, *i.e.,* minor degradation of hearing capabilities within regions of hearing that align most completely with the frequency range of the energy produced by pile driving, *i.e.,* the low-frequency region below 2 kHz, not severe hearing impairment or impairment in the regions of greatest hearing sensitivity. If hearing impairment occurs, it is most likely that the affected animal will lose a few decibels in its hearing sensitivity, which in most cases is not likely to

meaningfully affect its ability to forage and communicate with conspecifics.

Habitat disturbance and alteration resulting from project activities could have a few highly localized, short-term effects for a few marine mammals, however, the area of affected habitat would be small compared to that available to marine mammal species. The activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammals' foraging opportunities in a limited portion of the foraging range. We do not expect pile driving activities to have significant, long-term consequences to marine invertebrate populations. Given the short duration of the activities and the relatively small area of the habitat that may be affected, the impacts to marine mammal habitat, including fish and invertebrates, are not expected to cause significant or long-term negative consequences.

AGDC's February to April pile driving contingency period overlaps with the period when ringed seals are constructing subnivean lairs, giving birth, and nursing pups. As discussed in the Proposed Mitigation section, AGDC will be required to begin construction prior to March 1 when ringed seals are known to begin constructing lairs. As such, we expect that ringed seals will construct their lairs away from the pile driving operations, therefore minimizing disturbance and avoiding any potential for physical injury to seals in lairs. Additionally, we expect that AGDC will complete the majority, if not all of the pile driving during the open water season, so any pile driving that did remain could likely be completed in the earlier portion of the contingency period, further reducing the potential for impacts to ringed seals while lairing or pupping.

As previously described, UMEs have been declared for both gray whales and ice seals, however, neither UME provides cause for concern regarding population-level impacts to any of these stocks. For gray whales, the estimated abundance of the Eastern North Pacific stock is 26,960 (Carretta *et al.,* 2019) and the stock abundance has increased approximately 22 percent in comparison with 2010/2011 population levels (Durban *et al.,* 2017). For bearded seals, the minimum estimated mean M/SI (557) is well below the calculated partial PBR (8,210). This PBR is only a portion of that of the entire stock, as it does not include bearded seals that overwinter and breed in the Beaufort or Chukchi Seas (Muto *et al.,* 2019). For the Alaska stock of ringed seals and the Alaska stock of spotted seals, the M/SI (863 and 329, respectively) is well below the PBR for each stock (5,100 and 12,697, respectively) (Muto *et al.,* 2019). No serious injury, or mortality is expected or proposed for authorization, and Level B harassment takes of gray whale and ice seal species, and Level A harassment takes of ice seals will be reduced to the level of least practicable adverse impact through the incorporation of the proposed mitigation measures. As such, the proposed Level B harassment takes of gray whales and ice seals and proposed Level A harassment takes of ice seals is not expected to exacerbate or compound upon the ongoing UMEs.

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 or serious injury is anticipated or authorized;
- The relatively small number of Level A harassment exposures, for seals only, are anticipated to result only in slight PTS within the lower frequencies associated with pile driving;
- The area impacted by the specified activity is very small relative to the overall habitat ranges of all species;
- Impacts to critical behaviors such as lairing and pupping by ringed seals would be avoided and minimized through implementation of mitigation measures described above; and
- AGDC would cease pile driving and project vessels would transit landward of Cross Island during the Nuiqsut whaling season, therefore minimizing impacts to critical behavior (*i.e.,* migration).

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. When the predicted number of individuals to be taken is fewer than one third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The number of instances of take for each species or stock proposed to be taken as a result of this project is included in Table 19. Our analysis shows that less than one-third of the best available population abundance estimate of each stock could be taken by harassment (in fact, take of individuals is less than two percent of the abundance for all affected stocks). The number of animals proposed to be taken for each stock would be considered small relative to the relevant stock's abundances even if each estimated taking occurred to a new individual, which is an unlikely scenario.

For beluga whale, the percentages in Table 19 conservatively assume that all takes of beluga whale will be accrued to each stock, however, we expect that most, if not all, beluga whales taken by this project will be from the Beaufort Sea stock.

For the Alaska stock of bearded seals, a complete stock abundance value is not available. As noted in the 2019 Draft Alaska SAR (Muto *et al.,* 2019), an abundance estimate is currently only available for the portion of bearded seals in the Bering Sea (Conn *et al.,* 2012). The current abundance estimate for the Bering Sea is 301,836 bearded seals. Given the proposed 300 Level B harassment takes and 5 Level A harassment takes for the stock, comparison to the Bering Sea estimate, which is only a portion of the Alaska Stock (which also includes animals in the Chukchi and Beaufort Seas), shows that, at most, less than one percent of the stock is expected to be impacted.

A complete stock abundance value is also not available for the Alaska stock of ringed seals. As noted in the 2019 Draft Alaska SAR (Muto *et al.,* 2019), the abundance estimate available, 171,418 animals, is only a partial estimate of the Bering Sea portion of the population (Conn *et al.,* 2014). As noted in the SAR, this estimate does not include animals in the shore fast ice zone, and the authors did not account for availability bias. Muto *et al.* (2019) expect that the Bering Sea portion of the population is actually much higher. Given the proposed 1,765 Level B harassment takes and 32 Level A harassment takes for the stock, comparison to the Bering Sea partial estimate, which is only a

portion of the Alaska Stock (also includes animals in the Chukchi and Beaufort Seas), shows that, at most, less than two percent of the stock is expected to be impacted.

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

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

Project activities could deter target species from Prudhoe Bay and the area ensonified above the relevant harassment thresholds. However, as noted in the Effects of Specified Activities on Subsistence Uses of Marine Mammals section, subsistence use of seals is extremely limited in this area, as it is not within the preferred and frequented hunting areas. Bowhead whales typically remain outside of the area between the barrier islands and Prudhoe Bay, minimizing the likelihood of impacts from AGDC's project. Additionally, AGDC will cease pile driving activities during the Nuiqsut whaling season and will continue to coordinate with local communities and subsistence groups to minimize impacts of the project. AGDC will also be required to abide by the POC.

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 AGDC'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 whenever we propose to authorize take for endangered or threatened species, in this case with the Alaska Regional Office.

NMFS is proposing to authorize take of bowhead whale, bearded seal (Beringia DPS) and ringed seal (Arctic subspecies), which are listed under the ESA. The NMFS Alaska Regional Office issued a Biological Opinion under section 7 of the ESA, on the issuance of an IHA to AGDC under section 101(a)(5)(D) of the MMPA by the NMFS Office of Protected Resources. The Biological Opinion concluded that the action is not likely to jeopardize the continued existence of any of these species.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to AGDC for conducting construction of the Alaska LNG Project in Prudhoe Bay, Alaska from July 1, 2022 to June 30, 2023, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA can be found at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.*

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 project. We also request at this time comment on the potential 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 decisions on the request for this IHA or a subsequent Renewal IHA.

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

- A request for renewal is received no later than 60 days prior to the needed Renewal IHA effective date (recognizing that the Renewal IHA expiration date cannot extend beyond one year from expiration of the initial IHA).
- The request for renewal must include the following:

(1) An explanation that the activities to be conducted under the requested Renewal IHA are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.,* reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take); and

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

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

Dated: July 13, 2020.

Donna S. Wieting,

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

[FR Doc. 2020–15389 Filed 7–15–20; 8:45 am]

BILLING CODE 3510–22–P