DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648–XE175]

Marine Mammals; File No. 27911

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

ACTION: Notice; receipt of application.

SUMMARY: Notice is hereby given that Ari Friedlaender, Ph.D., University of California at Santa Cruz, 115 McAllister Way, Santa Cruz, CA 95060, has applied in due form for a permit to conduct research on eight whale species.

DATES: Written comments must be received on or before September 13, 2024.

ADDRESSES: The application and related documents are available for review by selecting ''Records Open for Public Comment'' from the ''Features'' box on the Applications and Permits for Protected Species home page, *https://apps.nmfs.noaa.gov,* and then selecting File No. 27911 from the list of available applications. These documents are also available upon written request via email to *NMFS.Pr1Comments@noaa.gov.*

Written comments on this application should be submitted via email to *NMFS.Pr1Comments@noaa.gov.* Please include File No. 27911 in the subject line of the email comment.

Those individuals requesting a public hearing should submit a written request via email to *NMFS.Pr1Comments@noaa.gov.* The request should set forth the specific reasons why a hearing on this application would be appropriate.

FOR FURTHER INFORMATION CONTACT: Amy Hapeman or Shasta McClenahan, Ph.D., (301) 427–8401.

SUPPLEMENTARY INFORMATION: The subject permit is requested under the authority of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 *et seq.*), the regulations governing the taking and importing of marine mammals (50 CFR part 216), the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*), and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR parts 222–226).

The applicant proposes to conduct research on eight species of whales in the Southern Ocean to understand their population demography, health, behavior, and ecology. Species targeted for study are: Antarctic minke (*Balaenoptera bonaerensis*), Arnoux's beaked (*B. arnouxii*), endangered blue (*B. musculus*), endangered fin (*B. physalus*), humpback (*Megaptera novaeangliae*), killer (*Orcinus orca*), endangered sei (*B. borealis*), endangered Southern right (*Eubalaena australis*) whales. Researchers would operate vessels and unmanned aircraft systems (UAS) to count, observe, photograph, biopsy sample, tag (suction-cup, dart, or deep implant), and track whales. Suction cup tags would be deployed by pole or UAS. A small number of adult humpback whales would receive two tag types at a time. Prey mapping would occur in the vicinity of some tagged whales. Biopsy samples would be imported into the United States for analysis and curation. See the application for take numbers by species. The permit would be valid for 5 years.

In compliance with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), an initial determination has been made that the activity proposed is categorically excluded from the requirement to prepare an environmental assessment or environmental impact statement.

Concurrent with the publication of this notice in the **Federal Register**, NMFS is forwarding copies of the application to the Marine Mammal Commission and its Committee of Scientific Advisors.

Dated: August 6, 2024.

Julia M. Harrison,

Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. 2024–17968 Filed 8–13–24; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648–XE173]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Office of Naval Research's Arctic Research Activities in the Beaufort and Chukchi Seas (Year 7)

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 Office of Naval Research (ONR) for authorization to take marine mammals incidental to Arctic Research Activities (ARA) in the Beaufort Sea and eastern Chukchi Sea. 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-time, 1-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 authorization and agency responses will be summarized in the final notice of our decision. The ONR's activities are considered military readiness activities pursuant to the MMPA, as amended by the National Defense Authorization Act for Fiscal Year 2004 (2004 NDAA).

DATES: Comments and information must be received no later than September 13, 2024.

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service and should be submitted via email to *ITP.clevenstine@noaa.gov.* Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-military-readiness-activities.* In case of problems accessing these documents, please call the contact listed below.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will 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: Alyssa Clevenstine, Office of Protected Resources, NMFS, (301) 427–8401.

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 proposed or, if the taking is limited to harassment, a notice of a proposed IHA is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking 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 monitoring and reporting of the takings. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

The 2004 NDAA (Pub. L. 108–136) removed the ''small numbers'' and ''specified geographical region'' limitations indicated above and amended the definition of ''harassment'' as applied to a ''military readiness activity.'' The activity for which incidental take of marine mammals is being requested qualifies as a military readiness activity.

National Environmental Policy Act

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

In 2018, the U.S. Navy prepared an Overseas Environmental Assessment (OEA) analyzing the project. Prior to issuing the IHA for the first year of this project, NMFS reviewed the 2018 EA and the public comments received, determined that a separate NEPA analysis was not necessary, and subsequently adopted the document and issued a NMFS Finding of No Significant Impact (FONSI) in support of the issuance of an IHA (83 FR 48799, September 27, 2018).

In 2019, the Navy prepared a supplemental OEA. Prior to issuing the IHA in 2019, NMFS reviewed the supplemental OEA and the public comments received, determined that a separate NEPA analysis was not necessary, and subsequently adopted the document and issued a NMFS FONSI in support of the issuance of an IHA (84 FR 50007, September 24, 2019).

In 2020, the Navy submitted a request for a renewal of the 2019 IHA. Prior to issuing the renewal IHA, NMFS reviewed ONR's application and determined that the proposed action was identical to that considered in the previous IHA. Because no significantly new circumstances or information relevant to any environmental concerns had been identified, NMFS determined that the preparation of a new or supplemental NEPA document was not necessary and relied on the supplemental OEA and FONSI from 2019 when issuing the renewal IHA in 2020 (85 FR 41560, July 10, 2020).

In 2021, the Navy submitted a request for an IHA for incidental take of marine mammals during continuation of ARA. NMFS reviewed the Navy's OEA and determined it to be sufficient for taking into consideration the direct, indirect, and cumulative effects to the human environment resulting from continuation of the ARA. NMFS subsequently adopted that OEA and signed a FONSI (86 FR 54931, October 5, 2021).

In 2022, the Navy submitted a request for an IHA for incidental take of marine mammals during continuation of ARA and prepared an OEA analyzing the project. Prior to issuing the IHA for the project, we reviewed the 2022–2025 OEA and the public comments received, determined that a separate NEPA analysis was not necessary, and subsequently adopted the document and issued our own FONSI in support of the issuance of an IHA (87 FR 57458, September 20, 2022).

In 2023, the ONR requested a renewal of the 2022 IHA for ongoing ARA from September 2023 to September 2024, and the 2022 IHA monitoring report. Prior to issuing the renewal IHA, NMFS reviewed ONR's application and determined that the proposed action was identical to that considered in the previous IHA. Because no significantly new circumstances or information relevant to any environmental concerns were identified, NMFS determined that the preparation of a new or supplemental NEPA document was not necessary and relied on the supplemental OEA and FONSI from 2022 when issuing the renewal IHA in 2023 (88 FR 65657, September 18, 2023).

Accordingly, NMFS preliminarily has determined to adopt the Navy's OEA for ONR ARA in the Beaufort and Chukchi Seas 2022–2025, 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 not cooperating agency on the U.S. Navy's OEA.

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 29, 2024, NMFS received a request from the ONR for an IHA to take marine mammals incidental to ARA in the Beaufort and Chukchi Seas. Following NMFS' review of the application, the ONR submitted a revised version on July 23, 2024. The application was deemed adequate and complete on August 5, 2024. The ONR's request is for take of beluga whales and ringed seals by Level B harassment only. Neither the ONR nor NMFS expect serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

This proposed IHA would cover the seventh year of a larger project for which ONR obtained prior IHAs and renewal IHAs (83 FR 48799, September 27, 2018; 84 FR 50007, September 24, 2019; 85 FR 53333, August 28, 2020; 86 FR 54931, October 5, 2021; 87 FR 57458, September 20, 2022; 88 FR 65657, September 18, 2023). ONR has complied with all the requirements (*e.g.,* mitigation, monitoring, and reporting) of the previous IHAs.

Description of Proposed Activity

Overview

The ONR proposes to conduct scientific experiments in support of ARA using active acoustic sources within the Beaufort and Chukchi Seas. Project activities involve acoustic testing and a multi-frequency navigation system concept test using left-behind active acoustic sources. The proposed experiments involve the deployment of moored, drifting, and ice-tethered active acoustic sources from the Research Vessel (R/V) Sikuliaq. Recovery of equipment may be from R/V Sikuliaq, U.S. Coast Guard Cutter (CGC) HEALY, or another vessel, and icebreaking may be required. Underwater sound from the active acoustic sources and noise from icebreaking may result in Level B harassment of marine mammals.

Dates and Duration

The proposed action would occur from September 2024 through September 2025 and include up to two research cruises. Acoustic testing would take place during the cruises, with the first cruise beginning September 2, 2024, and a potential second cruise occurring in summer or fall 2025, which may include up to 8 days of icebreaking activities.

Geographic Region

The proposed action would occur across the U.S. Exclusive Economic Zone (EEZ) in the Beaufort and Chukchi Seas, partially in the high seas north of Alaska, the Global Commons, and within a part of the Canadian EEZ (in which the appropriate permits would be obtained by the Navy) (figure 1). The proposed action would primarily occur in the Beaufort Sea but the analysis considers the drifting of active sources on buoys into the eastern portion of the Chukchi Sea. The closest point of the study area to the Alaska coast is 204 kilometers (km; 110 nautical miles (nm)). The proposed study area is approximately 639,267 square kilometers (km^2).

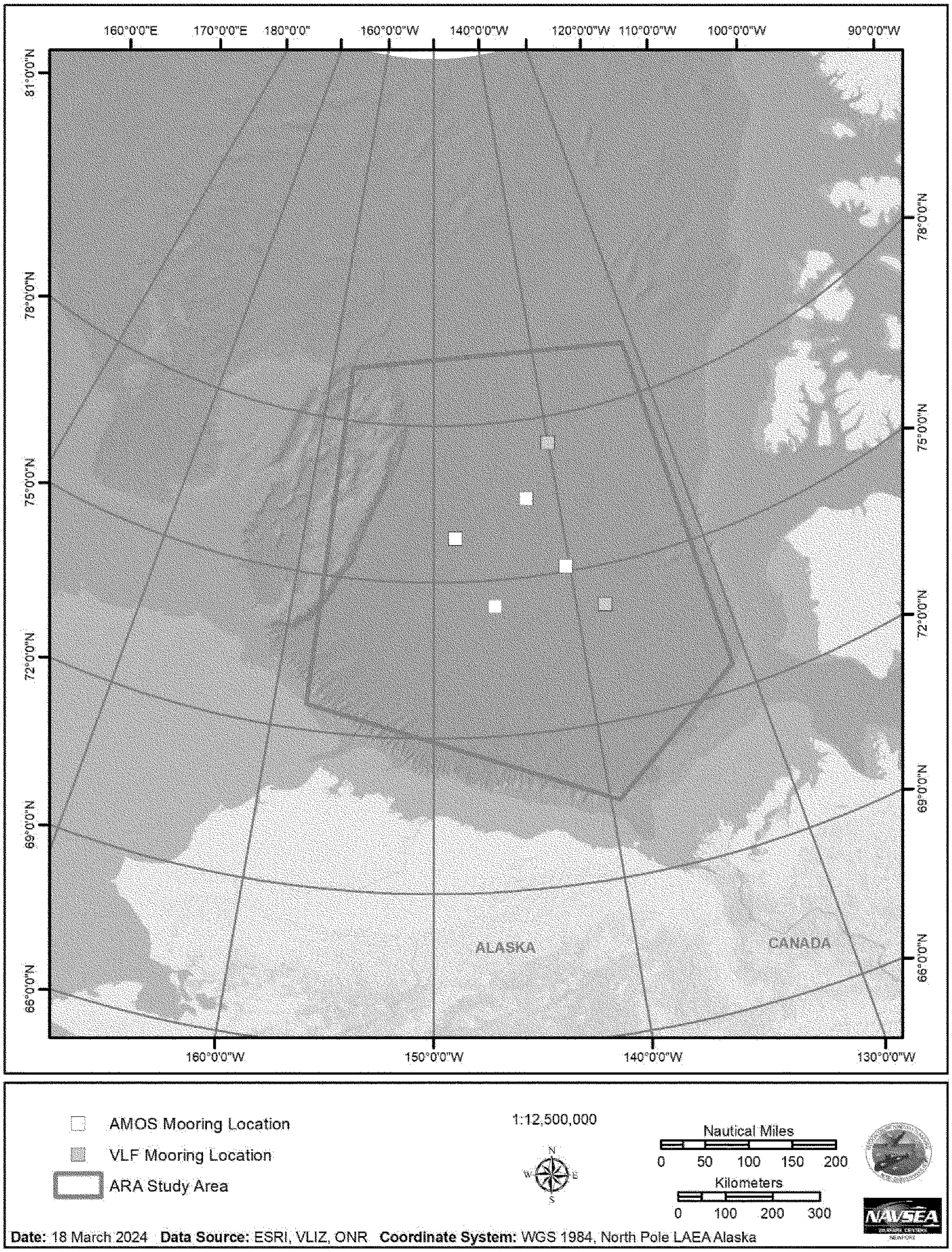

Figure 1 – Arctic Research Activities Study Area and Mooring Locations

Detailed Description of the Specified Activity

The ONR ARA Global Prediction Program supports two major projects: Stratified Ocean Dynamics of the Arctic (SODA) and Arctic Mobile Observing System (AMOS). The SODA and AMOS projects have been previously discussed in association with previously issued IHAs (83 FR 40234, August 14, 2018; 84 FR 37240, July 31, 2019). However, only activities relating to the AMOS project will occur during the period covered by this proposed action.

The proposed action constitutes the development of a modified system under the ONR AMOS involving very-low-, low-, and mid-frequency (VLF, LF, MF) transmissions (35 Hertz (Hz), 900 Hz, and 10 kilohertz (kHz), respectively). The AMOS project utilizes acoustic sources and receivers to provide a means of performing under-ice navigation for gliders and unmanned undersea vehicles (UUVs). This would allow for the possibility of year-round scientific observations of the environment in the Arctic. As an environment that is particularly affected by climate change, year-round observations under a variety of ice conditions are required to study the effects of this changing environment for military readiness, as well as the implications of environmental change to humans and animals. VLF technology is important in extending the range of navigation systems and has the potential to allow for development and use of navigational systems that would not be heard by some marine mammal species and, therefore, would be less impactful overall.

Up to six moorings (four fixed acoustic navigation sources transmitting at 900 Hz, two fixed VLF sources transmitting at 35 Hz) and two drifting ice gateway buoys (IGBs) would be configured with active acoustic sources and would operate for a period of up to 1 year. Four gliders with passive acoustics would be used to support drifting IGBs. No UUV use is planned during the September 2024 research cruise; however, there is the potential for one UUV (without active acoustic sources) to be deployed and up to 8 days of icebreaking activities to occur on a potential research cruise in summer/fall 2025, which would require the use of a vessel with ice-breaking capabilities (*e.g.,* CGC HEALY).

During the research cruise, acoustic sources would be deployed from the vessel for intermittent testing of the system components, which would take place in the vicinity of the source locations (figure 1). During this testing, 35 Hz, 900 Hz, 10 kHz, and acoustic modems would be employed. The six fixed moorings would be anchored on the seabed and held in the water column with subsurface buoys.

Autonomous vehicles would be able to navigate by receiving acoustic signals from multiple locations and triangulating. This is needed for vehicles that are under ice and cannot communicate with satellites. Source transmits would be offset by 15 minutes from each other (*i.e.,* sources would not be transmitting at the same time). All navigation sources would be recovered. The purpose of the navigation sources is to orient UUVs and gliders in situations when they are under ice and cannot communicate with satellites.

The proposed action would utilize non-impulsive acoustic sources, although not all sources will cause take of marine mammals (tables 1, 2). Marine mammal takes would arise from the operation of non-impulsive active sources. Although not currently planned, icebreaking could occur as part of this proposed action if a research vessel needs to return to the study area before the end of the IHA period to ensure scientific objectives are met. In this case, icebreaking could result in Level B harassment.

Below are descriptions of the platforms and equipment that would be deployed at different times during the proposed activity.

Research Vessels

The R/V Sikuliaq would perform the research cruise in September 2024 and conduct testing of acoustic sources during the cruise, as well as leave sources behind to operate as a year-round navigation system observation. The vessel to be used in a potential 2025 cruise is yet to be determined but the most probable option would be the CGC HEALY.

The R/V Sikuliaq has a maximum speed of approximately 12 knots (22.2 km per hour (km/hr)) with a cruising speed of 11 knots (20.4 km/hr). The R/V Sikuliaq is not an icebreaking ship but an ice strengthened ship. It would not be icebreaking and therefore acoustic signatures of icebreaking for the R/V Sikuliaq are not relevant. CGC HEALY travels at a maximum speed of 17 knots (31.5 km/hr) with a cruising speed of 12 knots (22.2 km/hr) and a maximum speed of 3 knots (5.6 km/hr) when traveling through 1.07 m (3.5 ft) of sea ice. While no icebreaking cruise on the CGC HEALY is scheduled during the IHA period, need may arise. Therefore, for the purposes of this IHA application, an icebreaking cruise is considered.

The R/V Sikuliaq, CGC HEALY, or any other vessel operating a research cruise associated with the Proposed Action may perform the following activities during their research cruises:

- Deployment of moored and/or ice-tethered passive sensors (oceanographic measurement devices, acoustic receivers);
- Deployment of moored and/or ice-tethered active acoustic sources to transmit acoustic signals;
- Deployment of UUVs;
- Deployment of drifting buoys, with or without acoustic sources; or,
- Recovery of equipment.

Glider Surveys

Glider surveys are proposed for the research cruise. All gliders would be recovered; some may be recovered during the cruise, but the remainder would be recovered at a later date. Up to four gliders would be deployed during the research cruise as part of on-ice operations (one to two gliders would be associated with each on-ice station).

Long-endurance, autonomous sea gliders are intended for use in extended missions in ice-covered waters. Gliders are buoyancy-driven, equipped with satellite modems providing two-way communication, and are capable of transiting to depths of up to 1,000 m (3,280 ft). Gliders would collect data in the area of the shallow water sources and moored sources, moving at a speed of 0.25 meters per second (m/s; 23 kilometers per day (km/day)). A combination of recent advances in sea glider technology would provide full-year endurance. When operating in ice-covered waters, gliders navigate by trilateration (the process of determining location by measurement of distances, using the geometry of circles, spheres or triangles) from moored acoustic sound sources (or dead reckoning should navigation signals be unavailable); they do not contain any active acoustic sources. Hibernating gliders would continue to track their position, waking to reposition should they drift too far from their target region. Gliders would measure temperature, salinity, dissolved oxygen, rates of dissipation of temperature variance (and vertical turbulent diffusivity), and multi-spectral down welling irradiance.

Moored and Drifting Acoustic Sources

During the September 2024 cruise, active acoustic sources would be lowered from the cruise vessel while stationary, deployed on gliders and UUVs, or deployed on fixed AMOS and VLF moorings for intermittent testing of the system components. The testing would take place in the vicinity of the source locations in figure 1. During this testing, 35 Hz, 900 Hz, 10 kHz, and acoustic modems would be employed. No UUV use is planned during the September 2024 research cruise but UUV use may be included in future test plans covered by this IHA.

Up to four fixed acoustic navigation sources transmitting at 900 Hz would remain in place for a year. These moorings would be anchored on the seabed and held in the water column with subsurface buoys. All sources would be deployed by shipboard winches, which would lower sources and receivers in a controlled manner. Anchors would be steel ‘‘wagon wheels’’ typically used for this type of deployment. Two VLF sources transmitting at 35 Hz would be deployed in a similar manner. Two drifting IGBs would also be configured with active acoustic sources.

TABLE 1—CHARACTERISTICS OF MODELED ACOUSTIC SOURCES

Platform (total number deployed)	Acoustic source	Purpose/ function	Frequency	Signal strength (dB re 1 µPa at 1 m)	Pulse width/duty cycle
REMUS 600 UUV [a] (up to 1).	WHOI Micro-modem	Acoustic communications.	900–950 Hz	NTE 180 dB by sys design limits.	5 pings/hour with 30 sec pulse length.
REMUS 600 UUV [a] (up to 1).	UUV/WHOI Micro-modem.	Acoustic communications.	8–14 kHz	NTE 185 dB by sys design limits.	10% average duty cycle, with 4 sec pulse length.
IGB (drifting) (2)	WHOI Micro-modem	Acoustic communications.	900–950 Hz	NTE 180 dB by sys design limits.	Transmit every 4 hours, 30 sec pulse length.
IGB (drifting) (2)	WHOI Micro-modem	Acoustic communications.	8–14 kHz	NTE 185 dB by sys design limits.	Typically receive only. Transmit is very intermittent.
Mooring (6)	WHOI Micro-modem (4).	Acoustic Navigation	900–950 Hz	NTE 180 dB by sys design limits.	Transmit every 4 hours, 30 sec pulse length.
Mooring (6)	VLF (2)	Acoustic Navigation	35 Hz	NTE 190 dB	Up to 4 times per day, 10 minutes each.

Note: dB re 1 µPa at 1 m = decibels referenced to 1 microPascal at 1 meter; Hz = Hertz; IGB = Ice Gateway Buoy; kHz = kilohertz; NTE = not to exceed; VLF = very low frequency; WHOI = Woods Hole Oceanographic Institution.

[a] REMUS use is not anticipated during the September 2024 cruise but is included in case of future use during the proposed IHA period.

Activities Not Likely To Result in Take

The following activities have been determined to be unlikely to result in take of marine mammals. These activities are described here but they are not discussed further in this notice.

De minimis Sources—The ONR characterizes *de minimis* sources as those with the following parameters: low source levels (SLs), narrow beams, downward directed transmission, short pulse lengths, frequencies outside known marine mammal hearing ranges, or some combination of these factors (Navy, 2013). NMFS concurs with the ONR's determination that the sources they have identified here as *de minimis* are unlikely to result in take of marine mammals. The following are some of the planned *de minimis* sources which would be used during the proposed action: Woods Hole Oceanographic Institution (WHOI) micromodem, Acoustic Doppler Current Profilers (ADCPs), ice profilers, and additional sources below 160 decibels referenced to 1 microPascal (dB re 1 µPa) used during towing operations. ADCPs may be used on moorings. Ice-profilers measure ice properties and roughness. The ADCPs and ice-profilers would all be above 200 kHz and therefore out of marine mammal hearing ranges, with the exception of the 75 kHz ADCP which has the characteristics and *de minimis* justification listed in table 2. They may be employed on moorings or UUVs.

A WHOI micromodem will also be employed during the leave behind period. In contrast with the WHOI micromodem usage described in table 1, which covers the use of the micromodem during research cruises, the use of the source during the leave behind period differs in nature. During this period, it is being used for very intermittent communication with vehicles to communicate vehicle status for safety of navigation purposes, and is treated as de minimis while employed in this manner.

TABLE 2—PARAMETERS FOR DE MINIMIS NON-IMPULSIVE ACOUSTIC SOURCES

Source name	Frequency range (kHz)	Sound pressure level (dB re 1 µPa at 1 m)	Pulse length (seconds)	Duty cycle (percent)	*De minimis* justification
ADCP	>200, 150, or 75	190	<0.001	<0.1	Very low pulse length, narrow beam, moderate source level.
Nortek Signature 500 kHz Doppler Velocity Log.	500	214	<0.1	<13	Very high frequency.
CTD Attached Echosounder	5–20	160	0.004	2	Very low source level.

Note: dB re 1 µPa at 1 m = decibels referenced to 1 microPascal at 1 meter; kHz = kilohertz; ADCP = acoustic Doppler current profiler; CTD = conductivity temperature depth.

Drifting Oceanographic Sensors—Observations of ocean-ice interactions require the use of sensors that are moored and embedded in the ice. For the proposed action, it will not be required to break ice to do this, as deployments can be performed in areas of low ice-coverage or free floating ice. Sensors are deployed within a few dozen meters of each other on the same ice floe. Three types of sensors would be used: autonomous ocean flux buoys, Integrated Autonomous Drifters, and ice-tethered profilers. The autonomous ocean flux buoys measure oceanographic properties just below the ocean-ice interface. The autonomous ocean flux buoys would have ADCPs and temperature chains attached, to measure temperature, salinity, and other ocean parameters the top 6 m (20 ft) of the water column. Integrated Autonomous Drifters would have a long temperate string extending down to 200 m (656 ft) depth and would incorporate meteorological sensors, and a temperature spring to estimate ice thickness. The ice-tethered profilers would collect information on ocean temperature, salinity, and velocity down to 250 m (820 ft) depth.

Up to 20 Argo-type autonomous profiling floats may be deployed in the central Beaufort Sea. Argo float drift at 1,500 m (4,921 ft) depth, profiling from 2,000 m (6,562 ft) to the sea surface once every 10 days to collect profiles of temperature and salinity. Moored Oceanographic Sensors—Moored sensors would capture a range of ice, ocean, and atmospheric conditions on a year-round basis. These would be bottom anchored, sub-surface moorings measuring velocity, temperature, and salinity in the upper 500 m (1,640 ft) of the water column. The moorings also collect high-resolution acoustic measurements of the ice using the ice profilers described above. Ice velocity and surface waves would be measured by 500 kHz multibeam sonars from Nortek Signatures. The moored oceanographic sensors described above use only de minimis sources and are therefore not anticipated to have the potential for impacts on marine mammals or their habitat. On-ice Measurements—On-ice measurement systems would be used to collect weather data. These would include an Autonomous Weather Station and an Ice Mass Balance Buoy. The Autonomous Weather Station would be deployed on a tripod; the tripod has insulated foot platforms that are frozen into the ice. The system would consist of an anemometer, humidity sensor, and pressure sensor. The Autonomous Weather Station also includes an altimeter that is *de minimis* due to its very high frequency (200 kHz). The Ice Mass Balance Buoy is a 6 m (20 ft) sensor string, which is deployed through a 5 centimeter (cm; 2 inch (in)) hole drilled into the ice. The string is weighted by a 1 kilogram (kg; 2.2 pound (lb)) lead weight and is supported by a tripod. The buoy contains a *de minimis* 200 kHz altimeter and snow depth sensor. Autonomous Weather Stations and Ice Mass Balance Buoys will be deployed and will drift with the ice, making measurements until their host ice floes melt, thus destroying the instruments (likely in summer, roughly 1 year after deployment). After the on-ice instruments are destroyed they cannot be recovered and would sink to the seafloor as their host ice floes melted.

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. NMFS fully considered all of this information, and we refer the reader to these descriptions, instead of reprinting the information. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.,* physical and behavioral descriptions) may be found on NMFS' website (*https://www.fisheries.noaa.gov/find-species*).

Table 3 lists all species or stocks for which take is expected and proposed to be authorized for this activity and summarizes information related to the population or stock, including regulatory status under the MMPA and Endangered Species Act (ESA) and potential biological removal (PBR), where known. 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' SARs). While no serious injury or mortality is anticipated or proposed to be authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species or stocks and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the 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' U.S. Alaska SARs (Young *et al.,* 2023). All values presented in table 3 are the most recent available at the time of publication and are available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments.*

TABLE 3—SPECIES LIKELY IMPACTED BY THE SPECIFIED ACTIVITIES [1]

Common name	Scientific name	Stock	ESA/MMPA status; strategic (Y/N) [2]	Stock abundance (CV, N_{min}, most recent abundance survey) [3]	PBR	Annual M/SI [4]
Beluga Whale	*Delphinapterus leucas*	Beaufort Sea	-, -, N	39,258 (0.229, N/A, 1992)	UND	104
Beluga Whale	*Delphinapterus leucas*	Eastern Chukchi	-, -, N	13,305 (0.51, 8,875, 2017)	178	56
Ringed Seal	*Pusa hispida*	Arctic	T, D, Y	UND [5] (UND, UND, 2013)	UND	6,459

[1] Information on the classification of marine mammal species can be found on the web page for The Society for Marine Mammalogy's Committee on Taxonomy (*https://marinemammalscience.org/science-and-publications/list-marine-mammal-species-subspecies/*).

[2] 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.

[3] NMFS marine mammal stock assessment reports online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.* CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance.

[4] 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, vessel strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.

[5] A reliable population estimate for the entire stock is not available. Using a sub-sample of data collected from the U.S. portion of the Bering Sea, an abundance estimate of 171,418 ringed seals has been calculated, but this estimate does not account for availability bias due to seals in the water or in the shore-fast ice zone at the time of the survey. The actual number of ringed seals in the U.S. portion of the Bering Sea is likely much higher. Using the N_{min} based upon this negatively biased population estimate, the PBR is calculated to be 4,755 seals, although this is also a negatively biased estimate.

As indicated above, both species (with three managed stocks) in table 3 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur. While bowhead whales (*Balaena mysticetus*), gray whales (*Eschrichtius robustus*), bearded seals (*Erignathus barbatus*), spotted seals (*Phoca largha*), and ribbon seals (*Histriophoca fasciata*) have been documented in the area, the temporal and/or spatial occurrence of these species is such that take is not expected to occur, and they are not discussed further beyond the explanation provided below.

Due to the location of the study area (*i.e.,* northern offshore, deep water), there were no calculated exposures for the bowhead whale, gray whale, bearded seal, spotted seal, and ribbon seal from quantitative modeling of acoustic sources. Bowhead and gray whales are closely associated with the shallow waters of the continental shelf in the Beaufort Sea and are unlikely to be exposed to acoustic harassment from this activity (Young *et al.,* 2023). Gray whales feed primarily in the Beaufort Sea, Chukchi Sea, and Northwestern Bering Sea during the summer and fall, but migrate south to winter in Baja California lagoons (Young *et al.,* 2023). Gray whales are primarily bottom feeders (Swartz *et al.,* 2006) in water depths of less than 60 m (196.9 ft) (Pike, 1962). Therefore, on the rare occasion that a gray whale does overwinter in the Beaufort Sea (Stafford *et al.,* 2007), we would expect an overwintering individual to remain in shallow water over the continental shelf where it could feed. Spotted seals tend to prefer pack ice areas with water depths less than 200 m (656.2 ft) during the spring and move to coastal habitats in the summer and fall, found as far north as 69–72 degrees N (Muto *et al.,* 2021). Although the study area includes some waters south of 72 degrees N, the acoustic sources with the potential to result in take of marine mammals are not found below that latitude and spotted seals are not expected to be exposed. Ribbon seals are found year-round in the Bering Sea but may seasonally range into the Chukchi Sea (Muto *et al.,* 2021). The proposed action occurs primarily in the Beaufort Sea, outside of the core range of ribbon seals, thus ribbon seals are not expected to be behaviorally harassed. Narwhals (*Monodon monoceros*) are considered extralimital in the project area and are not expected to be encountered. As no harassment is expected of the bowhead whale, gray whale, spotted seal, bearded seal, ribbon seal, and narwhal, these species will not be discussed further in this proposed notice.

The ONR utilized Conn *et al.* (2014) in their IHA application as an abundance estimate for ringed seals, which is based upon aerial abundance and distribution surveys conducted in the U.S. portion Bering Sea in 2012 (171,418 ringed seals) (Muto *et al.,* 2021). This value is likely an underestimate due to the lack of accounting for availability bias for seals that were in the water at the time of the surveys as well as not including seals located within the shore-fast ice zone (Muto *et al.,* 2021). Muto *et al.* (2021) notes that an accurate population estimate is likely larger by a factor of two or more. However, no accepted population estimate is present for Arctic ringed seals. Therefore, NMFS will also adopt the Conn *et al.* (2014) abundance estimate (171,418) for further analyses and discussions on this proposed action by ONR.

In addition, the polar bear (*Ursus maritimus*) and Pacific walrus (*Odobenus rosmarus*) may be found both on sea ice and/or in the water within the Beaufort Sea and Chukchi Sea. These species are managed by the U.S. Fish and Wildlife Service rather than NMFS and, therefore, they are not considered further in this document.

Beluga Whale

Beluga whales are distributed throughout seasonally ice-covered arctic and subarctic waters of the Northern Hemisphere (Gurevich, 1980), and are closely associated with open leads and polynyas in ice-covered regions (Hazard, 1988). Belugas may be either migratory or residential (non-migratory), depending on the population. Seasonal distribution is affected by ice cover, tidal conditions, access to prey, temperature, and human interaction (Frost *et al.,* 1985; Hauser *et al.,* 2014).

There are five beluga whale stocks recognized within U.S. waters: Cook Inlet, Bristol Bay, eastern Bering Sea, eastern Chukchi Sea, and Beaufort Sea. Two stocks, the Beaufort Sea and eastern Chukchi Sea stocks, have the potential to occur in the location of this proposed action.

Migratory Biologically Important Areas (BIAs) for belugas in the eastern Chukchi and Alaskan Beaufort Sea overlap the southern and western portion of the Study Area (Clarke *et al.,* 2023). A migration corridor for both stocks of beluga whale includes the eastern Chukchi Sea through the Beaufort Sea, with the Beaufort Sea stock utilizing the migratory BIA in April-May and the Eastern Chukchi Sea stock utilizing portions of the area in November. There are also feeding BIAs for both stocks throughout the Arctic region (Clarke *et al.,* 2023). During the winter, they can be found foraging in offshore waters associated with pack ice. When the sea ice melts in summer, they move to warmer river estuaries and coastal areas for molting and calving (Muto *et al.,* 2021). Annual migrations can span over thousands of kilometers. The residential Beaufort Sea populations participate in short distance movements within their range throughout the year. Based on satellite tags (Suydam *et al.,* 2001; Hauser *et al.,* 2014), there is some overlap in distribution with the eastern Chukchi Sea beluga whale stock.

During the winter, eastern Chukchi Sea belugas occur in offshore waters associated with pack ice. In the spring, they migrate to warmer coastal estuaries, bays, and rivers where they may molt (Finley, 1982; Suydam, 2009), give birth to, and care for their calves (Sergeant and Brodie, 1969). Eastern Chukchi Sea belugas move into coastal areas, including Kasegaluk Lagoon (outside of the proposed project site), in late June and animals are sighted in the area until about mid-July (Frost and Lowry, 1990; Frost *et al.,* 1993). Satellite tags attached to eastern Chukchi Sea belugas captured in Kasegaluk Lagoon during the summer showed these whales traveled 1,100 km (593 nm) north of the Alaska coastline, into the Canadian Beaufort Sea within three months (Suydam *et al.,* 2001). Satellite telemetry data from 23 whales tagged during 1998–2007 suggest variation in movement patterns for different age and/or sex classes during July-September (Suydam *et al.,* 2005). Adult males used deeper waters and remained there for the duration of the summer; all belugas that moved into the Arctic Ocean (north of 75 degrees N) were males, and males traveled through 90 percent pack ice cover to reach deeper waters in the Beaufort Sea and Arctic Ocean (79–80 degrees N) by late July/early August. Adult and immature female belugas remained at or near the shelf break in the south through the eastern Bering Strait into the northern Bering Sea, remaining north of Saint Lawrence Island over the winter.

Ringed Seal

Ringed seals are the most common pinniped in the Study Area and have wide distribution in seasonally and permanently ice-covered waters of the Northern Hemisphere (North Atlantic Marine Mammal Commission, 2004). Throughout their range, ringed seals have an affinity for ice-covered waters and are well adapted to occupying both shore-fast and pack ice (Kelly, 1988). Ringed seals can be found further offshore than other pinnipeds since they can maintain breathing holes in ice thickness greater than 2 m (6.6 ft) (Smith and Stirling, 1975). The breathing holes are maintained by ringed seals using their sharp teeth and claws found on their fore flippers. They remain in contact with ice most of the year and use it as a platform for molting in late spring to early summer, for pupping and nursing in late winter to early spring, and for resting at other times of the year (Muto *et al.,* 2018).

Ringed seals have at least two distinct types of subnivean lairs: Haulout lairs and birthing lairs (Smith and Stirling, 1975). Haul-out lairs are typically single-chambered and offer protection from predators and cold weather. Birthing lairs are larger, multi-chambered areas that are used for pupping in addition to protection from predators. Ringed seals pup on both shore-fast ice as well as stable pack ice. Lentfer (1972) found that ringed seals north of Utqiaġvik, Alaska, build their subnivean lairs on the pack ice near pressure ridges. Since subnivean lairs were found north of Utqiaġvik, Alaska, in pack ice, they are also assumed to be found within the sea ice in the proposed project site. Ringed seals excavate subnivean lairs in drifts over their breathing holes in the ice, in which they rest, give birth, and nurse their pups for 5–9 weeks during late winter and spring (Chapskii, 1940; McLaren, 1958; Smith and Stirling, 1975). Ringed seals are born beginning in March but the majority of births occur in early April. About a month after parturition, mating begins in late April and early May.

In Alaskan waters, during winter and early spring when sea ice is at its maximum extent, ringed seals are abundant in the northern Bering Sea, Norton and Kotzebue Sounds, and throughout the Chukchi and Beaufort seas (Frost, 1985; Kelly, 1988). Passive acoustic monitoring of ringed seals from a high frequency recording package deployed at a depth of 240 m (787 ft) in the Chukchi Sea 120 km (65 nm) north-northwest of Utqiaġvik, Alaska detected ringed seals in the area between mid-December and late May over the 4 year study (Jones *et al.,* 2014). In addition, ringed seals have been observed near and beyond the outer boundary of the U.S. EEZ (Beland and Ireland, 2010). During the spring and early summer, ringed seals may migrate north as the ice edge recedes and spend their summers in the open water period of the northern Beaufort and Chukchi Seas (Frost, 1985). Foraging-type movements have been recorded over the continental shelf and north of the continental shelf waters (Von Duyke *et al.,* 2020). During this time, sub-adult ringed seals may also occur in the Arctic Ocean Basin (Hamilton *et al.,* 2015; Hamilton *et al.,* 2017).

With the onset of fall freeze, ringed seal movements become increasingly restricted and seals will either move west and south with the advancing ice pack with many seals dispersing throughout the Chukchi and Bering Seas, or remaining in the Beaufort Sea (Crawford *et al.,* 2012; Frost and Lowry, 1984; Harwood *et al.,* 2012). Kelly *et al.* (2010a) tracked home ranges for ringed seals in the subnivean period (using shore-fast ice); the size of the home ranges varied from less than 1 up to 279 km^2 (median = 0.62 km^2 for adult males, 0.65 km^2 for adult females). Most (94 percent) of the home ranges were less than 3 km^2 during the subnivean period (Kelly *et al.,* 2010a). Near large polynyas, ringed seals maintain ranges, up to 7,000 km^2 during winter and 2,100 km^2 during spring (Born *et al.,* 2004). Some adult ringed seals return to the same small home ranges they occupied during the previous winter (Kelly *et al.,* 2010a). The size of winter home ranges can vary by up to a factor of 10 depending on the amount of fast ice; seal movements were more restricted during winters with extensive fast ice, and were much less restricted where fast ice did not form at high levels (Harwood *et al.,* 2015).

Of the five recognized subspecies of ringed seals, the Arctic ringed seal occurs in the Arctic Ocean and Bering Sea and is the only stock that occurs in U.S. waters. NMFS listed the Arctic ringed seal subspecies as threatened under the ESA on December 28, 2012 (77 FR 76706), primarily due to anticipated loss of sea ice through the end of the 21st century. Climate change presents a major concern for the conservation of ringed seals due to the potential for long-term habitat loss and modification (Muto *et al.,* 2021). Based upon an analysis of various life history features and the rapid changes that may occur in ringed seal habitat, ringed seals are expected to be highly sensitive to climate change (Laidre *et al.,* 2008; Kelly *et al.,* 2010b).

Critical Habitat

Critical habitat for the ringed seal was designated in May 2022 and includes marine waters within one specific area in the Bering, Chukchi, and Beaufort Seas (87 FR 19232, April 1, 2022). Essential features established by NMFS for conservation of ringed seals are (1) snow-covered sea ice habitat suitable for the formation and maintenance of subnivean birth lairs used for sheltering pups during whelping and nursing, which is defined as waters 3 m (9.8 ft) or more in depth (relative to Mean Lower Low Water (MLLW)) containing areas of seasonal land-fast (shore-fast) ice or dense, stable pack ice, that have undergone deformation and contain snowdrifts of sufficient depth to form and maintain birth lairs (typically at least 54 cm (21.3 in) deep); (2) sea ice habitat suitable as a platform for basking and molting, which is defined as areas containing sea ice of 15 percent or more concentration in waters 3 m (9.8 ft) or more in depth (relative to MLLW); and (3) primary prey resources to support Arctic ringed seals, which are defined to be small, often schooling, fishes, in particular Arctic cod (*Boreogadus saida*), saffron cod (*Eleginus gracilis*), and rainbow smelt (*Osmerus dentex*); and small crustaceans, in particular, shrimps and amphipods.

The Study Area does not overlap with ringed seal critical habitat (87 FR 19232, April 1, 2022). However, as stated in NMFS' final rule for the Designation of Critical Habitat for the Arctic Subspecies of the Ringed Seal (87 FR 19232, April 1, 2022), the area excluded from the critical habitat contains one or more of the essential features of the Arctic ringed seal's critical habitat, therefore, even though this area is excluded from critical habitat designation, habitat with the physical and biological features essential for ringed seal conservation is still available to the species, although data are limited to inform NMFS' assessment of the relative value of this area to the conservation of the species. As described later and in more detail in the Potential Effects of Specified Activities on Marine Mammals and Their Habitat section, we expect minimal impacts to marine mammal habitat as a result of the ONR's ARA, including impacts to ringed seal sea ice habitat suitable as a platform for basking and molting and impacts on prey availability.

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. 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) and Southall *et al.* (2019) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (behavioral response data, anatomical modeling, *etc.*). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 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 4.

TABLE 4—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 approximately 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 have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al.,* 2006; Kastelein *et al.,* 2009; Reichmuth *et al.,* 2013). This division between phocid and otariid pinnipeds is now reflected in the updated hearing groups proposed in Southall *et al.* (2019).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information.

Potential Effects of Specified Activities on Marine Mammals and Their Habitat

This section provides a discussion of the ways in which components of the specified activity may impact marine mammals and their habitat. The Estimated Take of Marine Mammals section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The Negligible Impact Analysis and Determination section considers the content of this section, the Estimated Take of Marine Mammals 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 whether those impacts are reasonably expected to, or reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

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 (ANSI, 1995). 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 activities may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

Active acoustic sources and icebreaking, if necessary, are proposed for use in the Study Area. The sounds produced by these activities fall into one of two general sound types: impulsive and non-impulsive. Impulsive sounds (*e.g.,* ice explosions, gunshots, sonic booms, impact pile driving) are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI, 1986; NIOSH, 1998; NMFS, 2018). Non-impulsive sounds (*e.g.,* aircraft, machinery operations such as drilling or dredging, vibratory pile driving, pile cutting, diamond wire sawing, 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, 1986; 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; Southall *et al.,* 2007).

The likely or possible impacts of the ONR's proposed action on marine mammals involve both non-acoustic and acoustic stressors. Potential non-acoustic stressors could result from the physical presence of vessels, equipment, and personnel (*e.g.,* icebreaking impacts, vessel and in-water vehicle strike, and bottom disturbance); however, any impacts to marine mammals are expected to primarily be acoustic in nature (*e.g.,* non-impulsive acoustic sources, noise from icebreaking vessel (''icebreaking noise''), and vessel noise).

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from active acoustic sources and noise from icebreaking is the means by which marine mammals may be harassed from the ONR's specified activity. In general, animals exposed to natural or anthropogenic sound may experience behavioral, physiological, and/or physical effects, ranging in magnitude from none to severe (Southall *et al.,* 2007). In general, exposure to pile driving noise has the potential to result in behavioral reactions (*e.g.,* avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior) and, in limited cases, an auditory threshold shift (TS). Exposure to anthropogenic noise can also lead to non-observable physiological responses such 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 noise on marine mammals are dependent on several factors, including, but not limited to, sound type (*e.g.,* impulsive versus non-impulsive), the species, age and sex class (*e.g.,* adult male versus mother 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 (*i.e.,* TS) followed by behavioral effects and potential impacts on habitat.

NMFS defines a noise-induced 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 TS is customarily expressed in dB and 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 animal uses sound within the frequency band of the signal) (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 TS approximates PTS onset (see Ward *et al.,* 1958; Ward *et al.,* 1959; Ward, 1960; Kryter *et al.,* 1966; Miller, 1974; Ahroon *et al.,* 1996; Henderson *et al.,* 2008). PTS levels for marine mammals are estimates as, with the exception of a single study unintentionally inducing PTS in a harbor seal (*e.g.,* 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)—TTS is a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Based on data from cetacean TTS measurements (see Southall *et al.,* 2007), a TTS of 6 dB is considered the minimum TS clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Finneran *et al.,* 2000; Schlundt *et al.,* 2000; Finneran *et al.,* 2002). As described in Finneran (2016), marine mammal studies have shown the amount of TTS increases with cumulative sound exposure level (SEL_{cum}) in an accelerating fashion: At low exposures with lower SEL_{cum}, the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher SEL_{cum}, 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 the Auditory Masking section). 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.

Many studies have examined noise-induced hearing loss in marine mammals (see Finneran, 2015; Southall *et al.,* 2019 for summaries). TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter *et al.,* 1966). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. For cetaceans, published data on the onset of TTS are limited to captive bottlenose dolphin (*Tursiops truncatus*), beluga whale, harbor porpoise (*Phocoena phocoena*), and Yangtze finless porpoise (*Neophocoena asiaeorientalis*) (Southall *et al.,* 2019). For pinnipeds in water, measurements of TTS are limited to harbor seals (*Phoca vitulina*), elephant seals (*Mirounga angustirostris*), bearded seals, and California sea lions (*Zalophus californianus*) (Kastak *et al.,* 1999; Kastak *et al.,* 2008; Kastelein *et al.,* 2020b; Reichmuth *et al.,* 2013; Sills *et al.,* 2020). TTS was not observed in spotted and ringed seals exposed to single airgun impulse sounds at levels matching previous predictions of TTS onset (Reichmuth *et al.,* 2016). These studies examine hearing thresholds measured in marine mammals before and after exposure to intense or long-duration sound exposure. The difference between the pre-exposure and post-exposure thresholds can be used to determine the amount of threshold shift at various post-exposure times.

The amount and onset of TTS depends on the exposure frequency. Sounds at low frequencies, well below the region of best sensitivity for a species or hearing group, are less hazardous than those at higher frequencies, near the region of best sensitivity (Finneran and Schlundt, 2013). At low frequencies, onset-TTS exposure levels are higher compared to those in the region of best sensitivity (*i.e.,* a low frequency noise would need to be louder to cause TTS onset when TTS exposure level is higher), as shown for harbor porpoises and harbor seals (Kastelein *et al.,* 2019a; Kastelein *et al.,* 2019b; Kastelein *et al.,* 2020a; Kastelein *et al.,* 2020b). Note that in general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran, 2015). In addition, TTS can accumulate across multiple exposures but the resulting TTS will be less than the TTS from a single, continuous exposure with the same SEL (Mooney *et al.,* 2009; Finneran *et al.,* 2010; Kastelein *et al.,* 2014; Kastelein *et al.,* 2015). This means that TTS predictions based on the total SEL_{cum} will overestimate the amount of TTS from intermittent exposures, such as sonars and impulsive sources. Nachtigall *et al.* (2018) describe measurements of hearing sensitivity of multiple odontocete species (bottlenose dolphin, harbor porpoise, beluga whale, and false killer whale (*Pseudorca crassidens*)) when a relatively loud sound was preceded by a warning sound. These captive animals were shown to reduce hearing sensitivity when warned of an impending intense sound. Based on these experimental observations of captive animals, the authors suggest that wild animals may dampen their hearing during prolonged exposures or if conditioned to anticipate intense sounds. Another study showed that echolocating animals (including odontocetes) might have anatomical specializations that might allow for conditioned hearing reduction and filtering of low-frequency ambient noise, including increased stiffness and control of middle ear structures and placement of inner ear structures (Ketten *et al.,* 2021). Data available on noise-induced hearing loss for mysticetes are currently lacking (NMFS, 2018). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species.

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

Activities for this project include active acoustics, equipment deployment and recovery, and, potentially, icebreaking. For the proposed action, these activities would not occur at the same time and 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 Study Area and not remaining for extended periods of time, the potential for TS declines.

Behavioral Harassment—Exposure to noise from pile driving and drilling also has the potential to behaviorally disturb marine mammals. Generally speaking, NMFS considers a behavioral disturbance that rises to the level of harassment under the MMPA a non-minor response—in other words, not every response qualifies as behavioral disturbance, and for responses that do, those of a higher level, or accrued across a longer duration, have the potential to affect foraging, reproduction, or survival. Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.,* minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Behavioral responses may include changing durations of surfacing and dives, changing direction and/or speed; reducing/increasing vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); eliciting a visible startle response or aggressive behavior (such as tail/fin slapping or jaw clapping); 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.,* 2004; Southall *et al.,* 2007; Southall *et al.,* 2019; Weilgart, 2007; Archer *et al.,* 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.,* 2012), and can vary depending on characteristics associated with the sound source (*e.g.,* whether it is moving or stationary, number of sources, distance from the source). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see Appendices B and C of Southall *et al.* (2007) and Gomez *et al.* (2016) for reviews of studies involving marine mammal behavioral responses to sound.

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

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

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

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

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

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

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

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

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

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

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

Behavioral Responses to Icebreaking Noise—Ringed seals on pack ice showed various behaviors when approached by an icebreaking vessel. A majority of seals dove underwater when the ship was within 0.93 km (0.5 nm) while others remained on the ice. However, as icebreaking vessels came closer to the seals, most dove underwater. Ringed seals have also been observed foraging in the wake of an icebreaking vessel (Richardson *et al.,* 1995) and may have preferentially established breathing holes in the ship tracks after the ice-breaker moved through the area. Previous observations and studies using icebreaking ships provide a greater understanding in how seal behavior may be affected by a vessel transiting through the area.

Adult ringed seals spend up to 20 percent of the time in subnivean lairs during the winter season (Kelly *et al.,* 2010a). Ringed seal pups spend about 50 percent of their time in the lair during the nursing period (Lydersen and Hammill, 1993). During the warm season ringed seals haul out on the ice. In a study of ringed seal haul out activity by Born *et al.* (2002), ringed seals spent 25–57 percent of their time hauled out in June, which is during their molting season. Ringed seal lairs are typically used by individual seals (haulout lairs) or by a mother with a pup (birthing lairs); large lairs used by many seals for hauling out are rare (Smith and Stirling, 1975). If the non-impulsive acoustic transmissions are heard and are perceived as a threat, ringed seals within subnivean lairs could react to the sound in a similar fashion to their reaction to other threats, such as polar bears (their primary predators), although the type of sound would be novel to them. Responses of ringed seals to a variety of human-induced sounds (*e.g.,* helicopter noise, snowmobiles, dogs, people, and seismic activity) have been variable; some seals entered the water and some seals remained in the lair. However, in all instances in which observed seals departed lairs in response to noise disturbance, they subsequently reoccupied the lair (Kelly *et al.,* 1988).

Ringed seal mothers have a strong bond with their pups and may physically move their pups from the birth lair to an alternate lair to avoid predation, sometimes risking their lives to defend their pups from potential predators. If a ringed seal mother perceives the proposed acoustic sources as a threat, the network of multiple birth and haulout lairs allows the mother and pup to move to a new lair (Smith and Stirling, 1975; Smith and Hammill, 1981). The acoustic sources from this proposed action are not likely to impede a ringed seal from finding a breathing hole or lair, as captive seals have been found to primarily use vision to locate breathing holes and no effect to ringed seal vision would occur from the acoustic disturbance (Elsner *et al.,* 1989; Wartzok *et al.,* 1992). It is anticipated that a ringed seal would be able to relocate to a different breathing hole relatively easily without impacting their normal behavior patterns.

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.,* Selye, 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 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 vessel traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as ''distress.'' In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003), however, distress is an unlikely result of the proposed project based on observations of marine mammals during previous, similar projects in the region.

Auditory Masking—Since many marine mammals rely on sound to find prey, moderate social interactions, and facilitate mating (Tyack, 2008), noise from anthropogenic sound sources can interfere with these functions, but only if the noise spectrum overlaps with the hearing sensitivity of the receiving marine mammal (Southall *et al.,* 2007; Clark *et al.,* 2009; Hatch *et al.,* 2012). Chronic exposure to excessive, though not high-intensity, noise could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions (Clark *et al.,* 2009). Acoustic masking is when other noises such as from human sources interfere with an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.,* those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.,* 1995; Erbe *et al.,* 2016). Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance fitness in survival and reproduction. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.,* signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.,* sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions (Hotchkin and Parks, 2013).

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

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

Marine mammals at or near the proposed project site may be exposed to anthropogenic noise which may be a source of masking. Vocalization changes may result from a need to compete with an increase in background noise and include increasing the source level, modifying the frequency, increasing the call repetition rate of vocalizations, or ceasing to vocalize in the presence of increased noise (Hotchkin and Parks, 2013). For example, in response to loud noise, beluga whales may shift the frequency of their echolocation clicks to prevent masking by anthropogenic noise (Eickmeier and Vallarta, 2023).

Masking is more likely to occur in the presence of broadband, relatively continuous noise sources such as vibratory pile driving. Energy distribution of pile driving covers a broad frequency spectrum, and sound from pile driving would be within the audible range of pinnipeds and cetaceans present in the proposed action area. While icebreaking during the ONR's proposed action may mask some acoustic signals that are relevant to the daily behavior of marine mammals, the short-term duration (up to 8 days) and limited areas affected make it very unlikely that the fitness of individual marine mammals would be impacted.

Potential Effects on Prey—The marine mammal species in the Study Area feed on marine invertebrates and fish. Studies of sound energy effects on invertebrates are few, and primarily identify behavioral responses. It is expected that most marine invertebrates would not sense the frequencies of the acoustic transmissions from the acoustic sources associated with the proposed action. Although acoustic sources used during the proposed action may briefly impact individuals, intermittent exposures to non-impulsive acoustic sources are not expected to impact survival, growth, recruitment, or reproduction of widespread marine invertebrate populations.

The fish species residing in the study area include those that are closely associated with the deep ocean habitat of the Beaufort Sea. Nearly 250 marine fish species have been described in the Arctic, excluding the larger parts of the sub-Arctic Bering, Barents, and Norwegian Seas (Mecklenburg *et al.,* 2011). However, only about 30 are known to occur in the Arctic waters of the Beaufort Sea (Christiansen and Reist, 2013). Although hearing capability data only exist for fewer than 100 of the 32,000 named fish species, current data suggest that most species of fish detect sounds from 50 to 100 Hz, with few fish hearing sounds above 4 kHz (Popper, 2008). It is believed that most fish have the best hearing sensitivity from 100 to 400 Hz (Popper, 2003). Fish species in the study area are expected to hear the low-frequency sources associated with the proposed action, but most are not expected to detect sound from the mid-frequency sources. Human generated sound could alter the behavior of a fish in a manner than would affect its way of living, such as where it tries to locate food or how well it could find a mate. Behavioral responses to loud noise could include a startle response, such as the fish swimming away from the source, the fish ''freezing'' and staying in place, or scattering (Popper, 2003). Misund (1997) found that fish ahead of a ship showed avoidance reactions at ranges of 49–149 m (160–489 ft). Avoidance behavior of vessels, vertically or horizontally in the water column, has been reported for cod and herring, and was attributed to vessel noise. While acoustic sources associated with the proposed action may influence the behavior of some fish species, other fish species may be equally unresponsive. Overall effects to fish from the proposed action would be localized, temporary, and infrequent.

Effects to Physical and Foraging Habitat—Ringed seals haul out on pack ice during the spring and summer to molt (Reeves *et al.,* 2002; Born *et al.,* 2002). Additionally, some studies suggested that ringed seals might preferentially establish breathing holes in ship tracks after vessels move through the area (Alliston, 1980; Alliston, 1981). The amount of ice habitat disturbed by activities is small relative to the amount of overall habitat available and there will be no permanent or longer-term loss or modification of physical ice habitat used by ringed seals. Vessel movement would have minimal effect on physical beluga habitat as beluga habitat is solely within the water column. Furthermore, the deployed sources that would remain in use after the vessels have left the survey area have low duty cycles and lower source levels, and any impacts to the acoustic habitat of marine mammals would be minimal.

Estimated Take of Marine Mammals

This section provides an estimate of the number of incidental takes proposed for authorization through the IHA, which will inform NMFS' consideration of the negligible impact determinations and impacts on subsistence uses.

Harassment is the only type of take expected to result from these activities. For this military readiness activity, the MMPA defines ''harassment'' as (i) Any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) Any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where the behavioral patterns are abandoned or significantly altered (Level B harassment).

Authorized takes would be by Level B harassment only, in the form of direct behavioral disturbances and/or TTS for individual marine mammals resulting from exposure to active acoustic transmissions and icebreaking. Based on the nature of the activity, Level A harassment is neither anticipated nor proposed to be authorized.

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

For acoustic impacts, 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) the number of days of activities. We note that while these factors can contribute to a basic calculation to provide an initial prediction of potential takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.,* previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the proposed take estimates.

Acoustic 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). Thresholds have also been developed identifying the received level of in-air sound above which exposed pinnipeds would likely be behaviorally harassed.

Level B Harassment

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 or exposure context (*e.g.,* frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source), the environment (*e.g.,* bathymetry, other noises in the area, predators in the area), and the receiving animals (hearing, motivation, experience, demography, life stage, depth) and can be difficult to predict (*e.g.,* Southall *et al.,* 2007; Southall *et al.,* 2021; Ellison *et al.,* 2012). Based on what the available science indicates and the practical need to use a threshold based on a metric that is both predictable and measurable for most activities, NMFS typically uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS generally predicts that marine mammals are likely to be behaviorally harassed in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above root-mean-squared pressure received levels (RMS SPL) of 120 dB re 1 μPa for continuous (*e.g.,* vibratory pile driving, drilling) and above RMS SPL 160 dB re 1 μPa for non-explosive impulsive (*e.g.,* seismic airguns) or intermittent (*e.g.,* scientific sonar) sources. Generally speaking, Level B harassment estimates based on these behavioral harassment thresholds are expected to include any likely takes by TTS as, in most cases, the likelihood of TTS occurs at distances from the source less than those at which behavioral harassment is likely. TTS of a sufficient degree can manifest as behavioral harassment, as reduced hearing sensitivity and the potential reduced opportunities to detect important signals (conspecific communication, predators, prey) may result in changes in behavior patterns that would not otherwise occur.

In this case, NMFS is proposing to adopt the ONR's approach to estimating incidental take by Level B harassment from the active acoustic sources for this action, which includes use of dose response functions. The ONR's dose response functions were developed to estimate take from sonar and similar transducers, but are not applicable to icebreaking. Multi-year research efforts have conducted sonar exposure studies for odontocetes and mysticetes (Miller *et al.,* 2012; Sivle *et al.,* 2012). Several studies with captive animals have provided data under controlled circumstances for odontocetes and pinnipeds (Houser *et al.,* 2013b; Houser *et al.,* 2013a). Moretti *et al.* (2014) published a beaked whale dose-response curve based on passive acoustic monitoring of beaked whales during U.S. Navy training activity at Atlantic Underwater Test and Evaluation Center during actual Anti-Submarine Warfare exercises. This information necessitated the update of the behavioral response criteria for the U.S. Navy's environmental analyses.

Southall *et al.* (2007), and more recently (Southall *et al.,* 2019), synthesized data from many past behavioral studies and observations to determine the likelihood of behavioral reactions at specific sound levels. While in general, the louder the sound source the more intense the behavioral response, it was clear that the proximity of a sound source and the animal's experience, motivation, and conditioning were also critical factors influencing the response (Southall *et al.,* 2007; Southall *et al.,* 2019). After examining all of the available data, the authors felt that the derivation of thresholds for behavioral response based solely on exposure level was not supported because context of the animal at the time of sound exposure was an important factor in estimating response. Nonetheless, in some conditions, consistent avoidance reactions were noted at higher sound levels depending on the marine mammal species or group allowing conclusions to be drawn. Phocid seals showed avoidance reactions at or below 190 dB re 1 μPa at 1 m; thus, seals may actually receive levels adequate to produce TTS before avoiding the source.

Odontocete behavioral criteria for non-impulsive sources were updated based on controlled exposure studies for dolphins and sea mammals, sonar, and safety (3S) studies where odontocete behavioral responses were reported after exposure to sonar (Miller *et al.,* 2011; Miller *et al.,* 2012; Antunes *et al.,* 2014; Miller *et al.,* 2014; Houser *et al.,* 2013b). For the 3S study, the sonar outputs included 1–2 kHz up- and down-sweeps and 6–7 kHz up-sweeps; source levels were ramped up from 152–158 dB re 1 μPa to a maximum of 198–214 re 1 μPa at 1 m. Sonar signals were ramped up over several pings while the vessel approached the mammals. The study did include some control passes of ships with the sonar off to discern the behavioral responses of the mammals to vessel presence alone versus active sonar.

The controlled exposure studies included exposing the Navy's trained bottlenose dolphins to mid-frequency sonar while they were in a pen. Mid-frequency sonar was played at six different exposure levels from 125–185 dB re 1 μPa (RMS). The behavioral response function for odontocetes resulting from the studies described above has a 50 percent probability of response at 157 dB re 1 μPa. Additionally, distance cutoffs (20 km for MF cetaceans) were applied to exclude exposures beyond which the potential of significant behavioral responses is considered to be unlikely.

The pinniped behavioral threshold was updated based on controlled exposure experiments on the following captive animals: hooded seal (*Cystophora cristata*), gray seal (*Halichoerus grypus*), and California sea lion (Götz *et al.,* 2010; Houser *et al.,* 2013a; Kvadsheim *et al.,* 2010). Hooded seals were exposed to increasing levels of sonar until an avoidance response was observed, while the grey seals were exposed first to a single received level multiple times, then an increasing received level. Each individual California sea lion was exposed to the same received level ten times. These exposure sessions were combined into a single response value, with an overall response assumed if an animal responded in any single session. The resulting behavioral response function for pinnipeds has a 50 percent probability of response at 166 dB re 1 μPa. Additionally, distance cutoffs (10 km for pinnipeds) were applied to exclude exposures beyond which the potential of significant behavioral responses is considered unlikely. For additional information regarding marine mammal thresholds for PTS and TTS onset, please see NMFS (2018) and table 6.

Empirical evidence has not shown responses to non-impulsive acoustic sources that would constitute take beyond a few km from a non-impulsive acoustic source, which is why NMFS and the Navy conservatively set distance cutoffs for pinnipeds and mid-frequency cetaceans (U.S. Department of the Navy, 2017a). The cutoff distances for fixed sources are different from those for moving sources, as they are treated as individual sources in ONR's modeling given that the distance between them is significantly greater than the range to which environmental effects can occur. Fixed source cutoff distances used were 5 km (2.7 nm) for pinnipeds and 10 km (5.4 nm) for beluga whales (table 5). As some of the on-site drifting sources could come closer together, the drifting source cutoffs applied were 10 km (5.4 nm) for pinnipeds and 20 km (10.8 nm) for beluga whales (table 5). Regardless of the received level at that distance, take is not estimated to occur beyond these cutoff distances. Range to thresholds were calculated for the noise associated with icebreaking in the study area. These all fall within the same cutoff distances as non-impulsive acoustic sources; range to behavioral threshold for both beluga whales and ringed seal were under 5 km (2.7 nm), and range to TTS threshold for both under 15 m (49.2 ft) (table 5).

TABLE 5—CUTOFF DISTANCES AND ACOUSTIC THRESHOLDS IDENTIFYING THE ONSET OF BEHAVIORAL DISTURBANCE, TTS, AND PTS FOR NON-IMPULSIVE SOUND SOURCES

Hearing group	Species	Fixed source behavioral threshold cutoff distance [a]	Drifting source behavioral threshold cutoff distance [a]	Behavioral criteria: Non-impulsive acoustic sources	Icebreaking source behavioral threshold cutoff distance [a b]	Behavioral criteria: icebreaking sources	Physiological criteria: onset TTS	Physiological criteria: onset PTS
Mid-frequency cetaceans.	Beluga whale	10 km (5.4 nm).	20 km (10.8 nm).	Mid-frequency BRF dose-response function*.	5 km (2.7 nm)	120 dB re 1 μPa step function.	178 dB SEL_{cum}.	198 dB SEL_{cum}.
Phocidae (in water).	Ringed seal ..	5 km (2.7 nm)	10 km (5.4 nm).	Pinniped dose-response function*.	5 km (2.7 nm)	120 dB re 1 μPa step function.	181 dB SEL_{cum}.	201 dB SEL_{cum}.

Note: The threshold values provided are assumed for when the source is within the animal's best hearing sensitivity. The exact threshold varies based on the overlap of the source and the frequency weighting (see figure 6–1 in IHA application).

[a] Take is not estimated to occur beyond these cutoff distances, regardless of the received level.

[b] Range to TTS threshold for both hearing groups for the noise associated with icebreaking in the Study Area is under 15 m (49.2 ft).

Level A Harassment

NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). The ONR's proposed action includes the use of non-impulsive (active sonar and icebreaking) sources; however, Level A harassment is not expected as a result of the proposed activities based on modeling, as described below, nor is it proposed to be authorized by NMFS.

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 6—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 1 μPa^2s. In this table, thresholds are abbreviated to reflect American National Standards Institute (ANSI) standards. 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.

Quantitative Modeling

The Navy performed a quantitative analysis to estimate the number of marine mammals likely to be exposed to underwater acoustic transmissions above the previously described threshold criteria during the proposed action. Inputs to the quantitative analysis included marine mammal density estimates obtained from the Kaschner *et al.* (2006) habitat suitability model and (Cañadas *et al.,* 2020), marine mammal depth occurrence (U.S. Department of the Navy, 2017b), oceanographic and mammal hearing data, and criteria and thresholds for levels of potential effects. The quantitative analysis consists of computer modeled estimates and a post-model analysis to determine the number of potential animal exposures. The model calculates sound energy propagation from the proposed non-impulsive acoustic sources, the sound received by animat (virtual animal) dosimeters representing marine mammals distributed in the area around the modeled activity, and whether the sound received by animats exceeds the thresholds for effects.

The Navy developed a set of software tools and compiled data for estimating acoustic effects on marine mammals without consideration of behavioral avoidance or mitigation. These tools and data sets serve as integral components of the Navy Acoustic Effects Model (NAEMO). In NAEMO, animats are distributed non-uniformly based on species-specific density, depth distribution, and group size information and animats record energy received at their location in the water column. A fully three-dimensional environment is used for calculating sound propagation and animat exposure in NAEMO. Site-specific bathymetry, sound speed profiles, wind speed, and bottom properties are incorporated into the propagation modeling process. NAEMO calculates the likely propagation for various levels of energy (sound or pressure) resulting from each source used during the training event.

NAEMO then records the energy received by each animat within the energy footprint of the event and calculates the number of animats having received levels of energy exposures that fall within defined impact thresholds. Predicted effects on the animats within a scenario are then tallied and the highest order effect (based on severity of criteria; *e.g.,* PTS over TTS) predicted for a given animat is assumed. Each scenario, or each 24-hour period for scenarios lasting greater than 24 hours is independent of all others, and therefore, the same individual marine mammal (as represented by an animat in the model environment) could be impacted during each independent scenario or 24-hour period. In few instances, although the activities themselves all occur within the proposed study location, sound may propagate beyond the boundary of the study area. Any exposures occurring outside the boundary of the study area are counted as if they occurred within the study area boundary. NAEMO provides the initial estimated impacts on marine species with a static horizontal distribution (*i.e.,* animats in the model environment do not move horizontally).

There are limitations to the data used in the acoustic effects model, and the results must be interpreted within this context. While the best available data and appropriate input assumptions have been used in the modeling, when there is a lack of definitive data to support an aspect of the modeling, conservative modeling assumptions have been chosen (*i.e.,* assumptions that may result in an overestimate of acoustic exposures):

- Animats are modeled as being underwater, stationary, and facing the source and therefore always predicted to receive the maximum potential sound level at a given location (*i.e.,* no porpoising or pinnipeds' heads above water);
- Animats do not move horizontally (but change their position vertically within the water column), which may overestimate physiological effects such as hearing loss, especially for slow moving or stationary sound sources in the model;
- Animats are stationary horizontally and therefore do not avoid the sound source, unlike in the wild where animals would most often avoid exposures at higher sound levels, especially those exposures that may result in PTS;
- Multiple exposures within any 24-hour period are considered one continuous exposure for the purposes of calculating potential threshold shift, because there are not sufficient data to estimate a hearing recovery function for the time between exposures; and
- Mitigation measures were not considered in the model. In reality, sound-producing activities would be reduced, stopped, or delayed if marine mammals are detected by visual monitoring.

Due to these inherent model limitations and simplifications, model-estimated results should be further analyzed, considering such factors as the range to specific effects, avoidance, and the likelihood of successfully implementing mitigation measures. This analysis uses a number of factors in addition to the acoustic model results to predict acoustic effects on marine mammals, as described below in the *Marine Mammal Occurrence and Take Estimation* section.

The underwater radiated noise signature for icebreaking in the central Arctic Ocean by CGC HEALY during different types of ice-cover was characterized in Roth *et al.* (2013). The radiated noise signatures were characterized for various fractions of ice cover. For modeling, the 8/10 and 3/10 ice cover were used. Each modeled day of icebreaking consisted of 16 hours of 8/10 ice cover and 8 hours of 3/10 ice cover. The sound signature of the 5/10 icebreaking activities, which would correspond to half-power icebreaking, was not reported in Roth *et al.* (2013); therefore, the full-power signature was used as a conservative proxy for the half-power signature. Icebreaking was modeled for 8 days total. Since ice forecasting cannot be predicted more than a few weeks in advance, it is unknown if icebreaking would be needed to deploy or retrieve the sources after 1 year of transmitting. Therefore, the potential for an icebreaking cruise on CGC HEALY was conservatively analyzed within the ONR's request for an IHA. As the R/V Sikuliaq is not capable of icebreaking, acoustic noise created by icebreaking is only modeled for the CGC HEALY. Figures 5a and 5b in Roth *et al.* (2013) depict the source spectrum level versus frequency for 8/10 and 3/10 ice cover, respectively. The sound signature of each of the ice coverage levels was broken into 1-octave bins (table 7). In the model, each bin was included as a separate source on the modeled vessel. When these independent sources go active concurrently, they simulate the sound signature of CGC HEALY. The modeled source level summed across these bins was 196.2 dB for the 8/10 signature and 189.3 dB for the 3/10 ice signature. These source levels are a good approximation of the icebreaker's observed source level (provided in figure 4b of Roth *et al.* (2013). Each frequency and source level was modeled as an independent source, and applied simultaneously to all of the animats within NAEMO. Each second was summed across frequency to estimate $SPL_{RMS.}$ Any animat exposed to sound levels greater than 120 dB was considered a take by Level B harassment. For PTS and TTS, determinations, sound exposure levels were summed over the duration of the test and the transit to the deep water deployment area. The method of quantitative modeling for icebreaking is considered to be a conservative approach; therefore, the number of takes estimated for icebreaking are likely an overestimate and would not be expected to reach that level.

TABLE 7—MODELED BINS FOR 8/10 ICE COVERAGE (FULL POWER) AND 3/10 ICE COVERAGE (QUARTER POWER) ICEBREAKING ON CGC HEALY

Frequency (Hz)	8/10 source level (dB)	3/10 source level (dB)
25	189	187
50	188	182
100	189	179
200	190	177
400	188	175
800	183	170
1,600	177	166
3,200	176	171
6,400	172	168
12,800	167	164

Non-Impulsive Acoustic Analysis

Most likely, individuals affected by acoustic transmission would move away from the sound source. Ringed seals may be temporarily displaced from their subnivean lairs in the winter, but a pinniped would have to be within 5 km (2.7 nm) of a moored source or within 10 km (5.4 nm) of a drifting source for any behavioral reaction. Any effects experienced by individual pinnipeds are anticipated to be short-term disturbance of normal behavior, or temporary displacement or disruption of animals that may be near elements of the proposed action.

Of historical sightings registered in the Ocean Biodiversity Information System Spatial Ecological Analysis of Megavertebrate Populations (OBIS–SEAMAP database) (Halpin *et al.,* 2009) in the ARA Study Area, nearly all (99 percent) occurred in summer and fall seasons. However, there is no documentation to prove that this is because ringed seals would all move out of the Study Area during the cold season, or if the lack of sightings is due to the harsh environment and ringed seal behavior being prohibitive factors for cold season surveying. OBIS–SEAMAP reports 542 animals sighted over 150 records in the ARA Study Area across all years and seasons. Taking the average of 542 animals in 150 records aligns with survey data from previous ARA cruises that show up to three ringed seals (or small, unidentified pinnipeds assumed to be ringed seals) per day sighted in the Study Area. To account for any unsighted animals, that number was rounded up to 4. Assuming that four animals would be present in the Study Area, a rough estimate of density can be calculated using the overall Study Area size:

$$4 \text{ ringed seals} \div 48{,}725 \text{ km}^2 = 0.00008209 \text{ ringed seals/km}^2$$

The area of influence surrounding each moored source would be 78.5 km^2, and the area of influence surrounding each drifting source would be 314 km^2. The total area of influence on any given day from non-impulsive acoustic sources would be 942 km^2. The number of ringed seals that could be taken daily can be calculated:

$$0.00008209 \text{ ringed seals/km}^2 \times 942 \text{ km}^2 = 0.077 \text{ ringed seals/day}$$

To be conservative, the ONR has assumed that one ringed seal would be exposed to acoustic transmissions above the threshold for Level B harassment, and that each would be exposed each day of the proposed action (365 days total). Unlike the NAEMO modeling approach used to estimate ringed seal takes in previous ARA IHAs, the occurrence method used in this ARA IHA request does not support the differentiation between behavioral or TTS exposures. Therefore, all takes are classified as Level B harassment and not further distinguished. Modeling for all previous years of ARA activities did not result in any estimated Level A harassment. NMFS has no reason to expect that the ARA activities during the effective dates of this IHA would be more likely to result in Level A harassment. Therefore, no Level A harassment is anticipated due to the proposed action.

Marine Mammal Occurrence and Take Estimation

In this section we provide information about the occurrence of marine mammals, including density or other relevant information which will inform the take calculations. We also describe how the marine mammal occurrence information is synthesized to produce a quantitative estimate of the take that is reasonably likely to occur and proposed for authorization.

The beluga whale density numbers utilized for quantitative acoustic modeling are from the Navy Marine Species Density Database (U.S. Department of the Navy, 2014). Where available (*i.e.,* June through 15 October over the continental shelf primarily), density estimates used were from Duke density modeling based upon line-transect surveys (Cañadas *et al.,* 2020). The remaining seasons and geographic area were based on the habitat-based modeling by Kaschner (2004) and Kaschner *et al.* (2006). Density for beluga whales was not distinguished by stock and varied throughout the project area geographically and monthly; the range of densities in the Study Area is shown in table 8. The density estimates for ringed seals are based on the habitat suitability modeling by Kaschner (2004) and Kaschner *et al.* (2006) and shown in table 8.

TABLE 8—DENSITY ESTIMATES OF IMPACTED SPECIES

Common name	Stock	Density (animals/km^2)
Beluga whale	Beaufort Sea	0.000506 to 0.5176
Beluga whale	Eastern Chukchi Sea	0.000506 to 0.5176
Ringed seal	Arctic	0.1108 to 0.3562

Take of all species would occur by Level B harassment only. NAEMO was previously used to produce a qualitative estimate of PTS, TTS, and behavioral exposures for ringed seals. For this proposed action, a new approach that utilizes sighting data from previous surveys conducted within the Study Area was used to estimate Level B harassment associated with non-impulsive acoustic sources (see section 6.4.3 of the IHA application). NAEMO modeling is still used to provide estimated takes of beluga whales associated with non-impulsive acoustic sources, as well as provide take estimations associated with icebreaking for both species. Table 9 shows the total number of requested takes by Level B harassment that NMFS proposes to authorize for both beluga whale stocks and the Arctic ringed seal stock based upon NAEMO modeled results.

Density estimates for beluga whales are equal as estimates were not distinguished by stock (Kaschner, 2004; Kaschner *et al.,* 2006). The ranges of the Beaufort Sea and Eastern Chukchi Sea beluga whales vary within the study area throughout the year (Hauser *et al.,* 2014). Based upon the limited information available regarding the expected spatial distributions of each stock within the study area, take has been apportioned equally to each stock (table 9). In addition, in NAEMO, animats do not move horizontally or react in any way to avoid sound, therefore, the current model may overestimate non-impulsive acoustic impacts.

TABLE 9—PROPOSED TAKE BY LEVEL B HARASSMENT

Species	Stock	Active acoustics	Icebreaking (behavioral)	Icebreaking (TTS)	Total proposed take	SAR abundance	Percentage of population
Beluga whale	Beaufort Sea	[a] 177	[a] 21	0	99	39,258	<1
Beluga whale	Chukchi Sea	[a] 177	[a] 21	0	99	13,305	<1
Ringed seal	Arctic	365	538	1	904	[b] UND (171, 418)	<1

[a] Acoustic and icebreaking exposures to beluga whales were not modeled at the stock level as the density value is not distinguished by stock in the Arctic for beluga whales (U.S. Department of the Navy, 2014). Estimated take of beluga whales due to active acoustics is 177 and 21 due to icebreaking activities, totaling 198 takes of beluga whales. The total take was evenly distributed among the two stocks.

[b] A reliable population estimate for the entire Arctic stock of ringed seals is not available and NMFS SAR lists it as Undetermined (UND). Using a sub-sample of data collected from the U.S. portion of the Bering Sea (Conn *et al.,* 2014), an abundance estimate of 171,418 ringed seals has been calculated but this estimate does not account for availability bias due to seals in the water or in the shore-fast ice zone at the time of the survey. The actual number of ringed seals in the U.S. portion of the Bering Sea is likely much higher. Using the minimum population size (N_{min} = 158,507) based upon this negatively biased population estimate, the PBR is calculated to be 4,755 seals, although this is also a negatively biased estimate.

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)). The 2004 NDAA amended the MMPA as it relates to military readiness activities and the incidental take authorization process such that ''least practicable impact'' shall include consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

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

(1) 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.

The following measures are proposed for this IHA:

- All vessels operated by or for the Navy must have personnel assigned to stand watch at all times while underway. Watch personnel must employ visual search techniques using binoculars. While underway and while using active acoustic sources/towed in-water devices, at least one person with access to binoculars is required to be on watch at all times.
- Vessel captains and vessel personnel must remain alert at all times, proceed with extreme caution, and operate at a safe speed so that the vessel can take proper and effective action to avoid any collisions with marine mammals.
- During moored and drifting acoustic source deployment and recovery, ONR must implement a mitigation zone of 55 m (180 ft) around the deployed source. Deployment and recovery must cease if a marine mammal is visually deterred within the mitigation zone. Deployment and recovery may recommence if any one of the following conditions are met:
  - The animal is observed exiting the mitigation zone;
  - The animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the sound source;
  - The mitigation zone has been clear from any additional sightings for a period of 15 minutes for pinnipeds and 30 minutes for cetaceans.
- Vessels must avoid approaching marine mammals head-on and must maneuver to maintain a mitigation zone of 457 m (500 yards) around all observed cetaceans and 183 m (200 yards) around all other observed marine mammals, provided it is safe to do so.
- Activities must cease if a marine mammal species for which take was not authorized, or a species for which authorization was granted but the authorized number of takes have been met, is observed approaching or within the mitigation zone (table 10). Activities must not resume until the animal is confirmed to have left the area.
- Vessel captains must maintain at-sea communication with subsistence hunters to avoid conflict of vessel transit with hunting activity.

TABLE 10—PROPOSED MITIGATION ZONES

Activity and/or effort type	Species	Mitigation zone
Acoustic source deployment and recovery, stationary	Beluga whale	55 m (180 ft).

TABLE 10—PROPOSED MITIGATION ZONES—Continued

Activity and/or effort type	Species	Mitigation zone
Acoustic source deployment and recovery, stationary	Ringed seal	55 m (180 ft).
Transit	Beluga whale	457 m (500 yards).
Transit	Ringed seal	183 m (200 yards).

Based on our evaluation of the applicant's proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, 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 while conducting the activities. 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 activity; or (4) biological or behavioral context of exposure (*e.g.,* age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.,* marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and,
- Mitigation and monitoring effectiveness.

The Navy has coordinated with NMFS to develop an overarching program plan in which specific monitoring would occur. This plan is called the Integrated Comprehensive Monitoring Program (ICMP) (U.S. Department of the Navy, 2011). The ICMP has been developed in direct response to Navy permitting requirements established through various environmental compliance efforts. As a framework document, the ICMP applies by regulation to those activities on ranges and operating areas for which the Navy is seeking or has sought incidental take authorizations. The ICMP is intended to coordinate monitoring efforts across all regions and to allocate the most appropriate level and type of effort based on a set of standardized research goals, and in acknowledgement of regional scientific value and resource availability.

The ICMP is focused on Navy training and testing ranges where the majority of Navy activities occur regularly as those areas have the greatest potential for being impacted. ONR's ARA in comparison is a less intensive test with little human activity present in the Arctic. Human presence is limited to the deployment of sources that would take place over several weeks. Additionally, due to the location and nature of the testing, vessels and personnel would not be within the study area for an extended period of time. As such, more extensive monitoring requirements beyond the basic information being collected would not be feasible as it would require additional personnel and equipment to locate seals and a presence in the Arctic during a period of time other then what is planned for source deployment. However, ONR will record all observations of marine mammals, including the marine mammal's species identification, location (latitude/longitude), behavior, and distance from project activities. ONR will also record date and time of sighting. This information is valuable in an area with few recorded observations.

Marine mammal monitoring must be conducted in accordance with the Navy's ICMP and the proposed IHA:

- While underway, all vessels must have at least one person trained through the U.S. Navy Marine Species Awareness Training Program on watch during all activities;
- Watch personnel must use standardized data collection forms, whether hard copy or electronic. Watch personnel must distinguish between sightings that occur during transit or during deployment or recovery of acoustic sources. Data must be recorded on all days of activities, even if marine mammals are not sighted;
- At minimum, the following information must be recorded:
  - Vessel name;
  - Watch personnel names and affiliation;
  - Effort type (*i.e.,* transit, deployment, recovery); and
  - Environmental conditions (at the beginning of watch stander shift and whenever conditions change significantly), including Beaufort Sea State (BSS) and any other relevant weather conditions, including cloud cover, fog, sun glare, and overall visibility to the horizon.
- Upon visual observation of any marine mammal, the following information must be recorded:
  - Date/time of sighting;
  - Identification of animal (*e.g.,* genus/species, lowest possible taxonomic level, or unidentified) and the composition of the group if there is a mix of species;
  - Location (latitude/longitude) of sighting;
  - Estimated number of animals (high/low/best);
  - Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);
  - Detailed behavior observations (*e.g.,* number of blows/breaths, number of surfaces, breaching, spyhopping,

diving, feeding, traveling; as explicit and detailed as possible; length of time observed in the mitigation zone, note any observed changes in behavior);

○ Distance from vessel to animal;

○ Direction of animal's travel relative to the vessel;

○ Platform activity at time of sighting (*i.e.,* transit, deployment, recovery); and

○ Weather conditions (*i.e.,* BSS, cloud cover).

○ During icebreaking, the following information must be recorded:

○ Start and end time of icebreaking; and

○ Ice cover conditions.

• During deployment and recovery of acoustic sources or UUVs, visual observation must begin 30 minutes prior to deployment or recovery and continue through 30 minutes following the source deployment or recovery.

• The ONR must submit its draft report(s) on all monitoring conducted under the IHA within 90 calendar days of the completion of monitoring or 60 calendar days prior to the requested issuance of any subsequent IHA for research activities at the same location, whichever comes first. A final report must be prepared and submitted within 30 calendar days following receipt of any NMFS comments on the draft report. If no comments are received from NMFS within 30 calendar days of receipt of the draft report, the report shall be considered final.

• All draft and final monitoring reports must be submitted to *PR.ITP.MonitoringReports@noaa.gov* and *ITP.clevenstine@noaa.gov.*

• The marine mammal report, at minimum, must include:

○ Dates and times (begin and end) of all marine mammal monitoring;

○ Acoustic source use or icebreaking;

○ Watch stander location(s) during marine mammal monitoring;

○ Environmental conditions during monitoring periods (at beginning and end of watch standing shift and whenever conditions change significantly), including BSS and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance;

○ Upon observation of a marine mammal, the following information:

▪ Name of watch stander who sighted the animal(s), the watch stander location, and activity at time of sighting;

▪ Time of sighting;

▪ Identification of the animal(s) (*e.g.,* genus/species, lowest possible taxonomic level, or unidentified), watch stander confidence in identification, and the composition of the group if there is a mix of species;

▪ Distance and location of each observed marine mammal relative to the acoustic source or icebreaking for each sighting;

▪ Estimated number of animals (min/max/best estimate);

▪ Estimated number of animals by cohort (adults, juveniles, neonates, group composition, *etc.*);

▪ Animal's closest point of approach and estimated time spent within the harassment zone; and

▪ Description of any marine mammal behavioral observations (*e.g.,* observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (*e.g.,* no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching.

○ Number of shutdowns during monitoring, if any;

○ Marine mammal sightings (including the marine mammal's location (latitude/longitude));

○ Number of individuals of each species observed during source deployment, operation, and recovery; and

○ Detailed information about implementation of any mitigation (*e.g.,* shutdowns, delays), a description of specific actions that ensued, and resulting changes in behavior of the animal(s), if any.

• The ONR must submit all watch stander data electronically in a format that can be queried, such as a spreadsheet or database (*i.e.,* digital images of data sheets are not sufficient).

• Reporting injured or dead marine mammals:

○ In the event that personnel involved in the specified activities discover an injured or dead marine mammal, the ONR must report the incident to the Office of Protected Resources (OPR), NMFS (*PR.ITP.MonitoringReports@noaa.gov* and *ITP.clevenstine@noaa.gov*) and to the Alaska regional stranding network (877–925–7773) as soon as feasible. If the death or injury was clearly caused by the specified activity, the ONR must immediately cease the activities until NMFS OPR 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 this IHA. The ONR 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.

• Vessel Strike: In the event of a vessel strike of a marine mammal by any vessel involved in the activities covered by the authorization, the ONR shall report the incident to OPR, NMFS and to the Alaska regional stranding coordinator (877–925–7773) as soon as feasible. The report must include the following information:

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

○ Species identification (if known) or description of the animal(s) involved;

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

○ Vessel's course/heading and what operations were being conducted (if applicable);

○ Status of all sound sources in use;

○ Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike;

○ Environmental conditions (*e.g.,* wind speed and direction, BSS, cloud cover, visibility) immediately preceding the strike;

○ Estimated size and length of animal that was struck;

○ Description of the behavior of the marine mammal immediately preceding and following the strike;

○ If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;

○ Estimated fate of the animal (*e.g.,* dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and

○ To the extent practicable, photographs or video footage of the animal(s).

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 impacts or responses (*e.g.,* intensity, duration), the context of any impacts or responses (*e.g.,* critical reproductive time or location, foraging impacts affecting energetics), 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' 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 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 discussion of our analysis applies to beluga whales and ringed seals, given that the anticipated effects of this activity on these different marine mammal stocks are expected to be similar. Where there are meaningful differences between species or stocks, or groups of species, 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.

Underwater acoustic transmissions associated with the proposed ARA, as outlined previously, have the potential to result in Level B harassment of beluga seals and ringed seals in the form of behavioral disturbances. No serious injury, mortality, or Level A harassment are anticipated to result from these described activities. Effects on individual belugas or ringed seals taken by Level B harassment could include alteration of dive behavior and/or foraging behavior, effects to breathing rates, interference with or alteration of vocalization, avoidance, and flight. More severe behavioral responses are not anticipated due to the localized, intermittent use of active acoustic sources. Exposure duration is likely to be short-term and individuals will, most likely, simply be temporarily displaced by moving away from the acoustic source. Exposures are, therefore, unlikely to result in any significant realized decrease in fitness for affected individuals or adverse impacts to stocks as a whole.

Arctic ringed seals are listed as threatened under the ESA. The primary concern for Arctic ringed seals is the ongoing and anticipated loss of sea ice and snow cover resulting from climate change, which is expected to pose a significant threat to ringed seals in the future (Muto *et al.,* 2021). In addition, Arctic ringed seals have also been experiencing a UME since 2019 although the cause of the UME is currently undetermined. As mentioned earlier, no mortality or serious injury to ringed seals is anticipated nor proposed to be authorized. Due to the short-term duration of expected exposures and required mitigation measures to reduce adverse impacts, we do not expect the proposed ARA to compound or exacerbate the impacts of the ongoing UME.

A small portion of the Study Area overlaps with ringed seal critical habitat. Although this habitat contains features necessary for ringed seal formation and maintenance of subnivean birth lairs, basking and molting, and foraging, these features are also available throughout the rest of the designated critical habitat area. Any potential limited displacement of ringed seals from the proposed ARA study area would not be expected to interfere with their ability to access necessary habitat features, given the availability of similar necessary habitat features nearby.

The Study Area also overlaps with beluga whale migratory and feeding BIAs. Due to the small amount of overlap between the BIAs and the proposed ARA study area as well as the low intensity and short-term duration of acoustic sources and required mitigation measures, we expect minimal impacts to migrating or feeding belugas. Shutdown zones are expected to avoid the potential for Level A harassment of belugas and ringed seals, and to minimize the severity of any Level B harassment. The requirements of trained dedicated watch personnel and speed restrictions will also reduce the likelihood of any ship strikes to migrating belugas.

In all, the proposed activities are expected to have minimal adverse effects on marine mammal habitat. While the activities may cause some fish to leave the area of disturbance, temporarily impacting marine mammals' foraging opportunities, this would encompass a relatively small area of habitat leaving large areas of existing fish and marine mammal foraging habitat unaffected. As such, the impacts to marine mammal habitat are not expected to impact the health or fitness of any marine mammals.

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 any of the species or stocks through effects on annual rates of recruitment or survival:

• No serious injury or mortality is anticipated or authorized;

• Impacts would be limited to Level B harassment only;

• Only temporary and relatively low-level behavioral disturbances are expected to result from these proposed activities; and

• Impacts to marine mammal prey or habitat will be minimal and short term.

The anticipated and authorized take is not expected to impact the reproduction or survival of any individual marine mammals, much less rates of recruitment or survival. 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.

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.

Subsistence hunting is important for many Alaska Native communities. A study of the North Slope villages of Nuiqsut, Kaktovik, and Utqiaġvik identified the primary resources used for subsistence and the locations for harvest (Stephen R. Braund & Associates, 2010), including terrestrial mammals, birds, fish, and marine mammals (bowhead whale, ringed seal, bearded seal, and walrus). Ringed seals and beluga whales are likely located within the project area during this proposed action, yet the proposed action would not remove individuals from the population nor behaviorally disturb them in a manner that would affect their behavior more than 100 km farther inshore where subsistence hunting occurs. The permitted sources would be placed far outside of the range for subsistence hunting. The closest active acoustic source (fixed or drifting) within the proposed project site that is likely to cause Level B harassment is approximately 204 km (110 nm) from land. This ensures a significant standoff distance from any subsistence hunting area. The closest distance to subsistence hunting (130 km (70 nm)) is well beyond the largest distance from the sound sources in use at which behavioral harassment would be expected to occur (20 km (10.8 nm)) described above. Furthermore, there is no reason to believe that any behavioral disturbance of beluga whales or ringed seals that occurs far offshore (we do not anticipate any Level A harassment) would affect their subsequent behavior in a manner that would interfere with subsistence uses should those animals later interact with hunters.

In addition, ONR has been communicating with the Native communities about the proposed action. The ONR-sponsored chief scientist for AMOS gave a briefing on ONR research planned for 2024–2025 Alaska Eskimo Whaling Commission (AEWC) meeting on December 15, 2023 in Anchorage, Alaska. No questions were asked from the commissioners during the brief or in subsequent weeks afterwards. The AEWC consists of representatives from 11 whaling villages (Wainwright, Utqiaġvik, Savoonga, Point Lay, Nuiqut, Kivalina, Kaktovik, Wales, Point Hope, Little Diomede, and Gambell). These briefings have communicated the lack of any effect on subsistence hunting due to the distance of the sources from hunting areas. ONR-supported scientists also attend Arctic Waterways Safety Committee (AWSC) and AEWC meetings on a regular basis to discuss past, present, and future research activities. While no take is anticipated to result during transit, points of contact for at-sea communication will also be established between vessel captains and subsistence hunters to avoid any conflict of ship transit with hunting activity.

Based on the description of the specified activity, distance of the study area from subsistence hunting grounds, 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 ONR's proposed activities.

Peer Review of the Monitoring Plan

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)). Given the factors discussed above, NMFS has also determined that the activity is not likely to affect the availability of any marine mammal species or stock for taking for subsistence uses, and therefore, peer review of the monitoring plan is not warranted for this project.

Endangered Species Act

Section 7(a)(2) of the ESA of 1973 (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 (AKR).

NMFS is proposing to authorize take of ringed seals, which are listed under the ESA. The Permits and Conservation Division has requested initiation of section 7 consultation with the AKR for the issuance of this IHA. NMFS will conclude the ESA consultation prior to reaching a determination regarding the proposed issuance of the authorization.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to the ONR for conducting a seventh year of ARA in the Beaufort and Chukchi Seas from September 2024 to September 2025, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA can be found at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-military-readiness-activities.*

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

- A request for renewal is received no later than 60 days prior to the needed renewal IHA effective date (recognizing that the renewal IHA expiration date cannot extend beyond 1 year from expiration of the initial IHA).
- The request for renewal must include 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).

(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: August 8, 2024.

Kimberly Damon-Randall,

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

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