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**National Oceanic and Atmospheric
Administration**

**Incidental Takes of Marine Mammals
During Specified Activities; Marine
Seismic Survey in the Arctic Ocean,
August to September, 2010; Notice**

DEPARTMENT OF COMMERCE**National Oceanic and Atmospheric Administration**

RIN 0648-XW05

Incidental Takes of Marine Mammals During Specified Activities; Marine Seismic Survey in the Arctic Ocean, August to September, 2010

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

ACTION: Notice; issuance of an incidental take authorization.

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA) regulations, notification is hereby given that NMFS issued an Incidental Harassment Authorization (IHA) to the U.S. Geological Survey (USGS) for the take of small numbers of marine mammals, by Level B harassment, incidental to conducting a marine seismic survey in the Arctic Ocean during August to September, 2010.

DATES: Effective August 11, 2010, through October 21, 2010.

ADDRESSES: A copy of the IHA and application are available by writing to P. Michael Payne, Chief, Permits, Conservation, and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910 or by telephoning the contact listed here.

A copy of the application containing a list of the references used in this document may be obtained by writing to the address specified above, telephoning the contact listed below (see **FOR FURTHER INFORMATION CONTACT**), or visiting the internet at: <http://www.nmfs.noaa.gov/pr/permits/incidental.htm>. Documents cited in this notice may be viewed, by appointment, during regular business hours, at the aforementioned address.

FOR FURTHER INFORMATION CONTACT: Howard Goldstein or Jolie Harrison, Office of Protected Resources, NMFS, 301-713-2289.

SUPPLEMENTARY INFORMATION:**Background**

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (Secretary) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by United States (U.S.) citizens who engage in a specified activity (other than

commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

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

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the United States can apply for an authorization not to exceed one year to incidentally take small numbers of marine mammals by harassment. Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as:

Any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild ["Level A harassment"]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering ["Level B harassment"].

16 U.S.C. 1362(18)

Section 101(a)(5)(D) establishes a 45-day time limit for NMFS' review of an application followed by a 30-day public notice and comment period for any proposed authorizations for the incidental harassment of marine mammals. Within 45 days of the close of the comment period, NMFS must either issue or deny the authorization.

Summary of Request

On March 9, 2010, NMFS received an IHA application and a draft Environmental Assessment (EA) from USGS for the taking, by Level B harassment only, of small numbers of several species of marine mammals incidental to conducting a marine seismic survey in the Arctic Ocean during August to September, 2010. NMFS received a revised IHA application on June 1, 2010, and a final EA on August 6, 2010.

Description of the Specified Activity

USGS is conducting a marine geophysical (seismic reflection/refraction) and bathymetric survey in the Arctic Ocean in August and September, 2010 (see Tables 1 and 2, and Figure 3 of the IHA application). The survey is being conducted from the Canadian Coast Guard (CCG) vessel CCGS *Louis S. St. Laurent* (*St. Laurent*) which will be accompanied by the U.S. Coast Guard Cutter (USCGC) *Healy*, both of which are polar-class icebreakers. Descriptions of the vessels and their specifications are presented in Appendix A of the IHA application. The two vessels operate in tandem in the presence of ice but may diverge and operate independently in open water. Some minor deviation of the dates is possible, depending on logistics and weather (i.e., the cruise may depart earlier or be extended due to poor weather; there could be extra days of seismic operations if collected data are of sub-standard quality).

One CCG helicopter is available for deployment from the *St. Laurent* for ice reconnaissance and crew transfers between the vessels during survey operations. Helicopter transfer of crew from the *Healy* is also planned for approximately one day during a ship-to-shore crew change at Barrow, Alaska at the end of the survey. The helicopter operations in Barrow will be conducted under Department of Interior (DOI) contract. Daily helicopter operations are anticipated pending weather conditions. Spot bathymetry will also be conducted from the helicopter outside U.S. waters.

Acoustic sources onboard the *St. Laurent* include an airgun array comprised of three Sercel G-airguns and a Knudsen 320BR "Chirp" pulse echosounder operating at 12 kHz. The *St. Laurent* also tows a 3 to 5 kHz sub-bottom profiler while in open water and when not working with the *Healy*. The airgun array consists of two 500 in³ and one 150 in³ airguns for an overall discharge of 1,150 in³. Table 2 of the IHA application presents different sound pressure level (SPL) radii of the airgun array. Acoustic sources being operated on the *St. Laurent* are described in detail in Section VII and Appendix B in the IHA application. The seismic array and a hydrophone streamer towed from the *St. Laurent* operate under the provisions of a Canadian authorization based on Canada's environmental assessment of the proposed survey while in Canadian or international waters, and under the provisions of an IHA issued to the USGS by NMFS in U.S. waters. NMFS cannot issue an IHA directly to a non-U.S.

citizen, however, the Geological Survey of Canada (GSC) has written a Categorical Declaration stating that “while in U.S. waters (i.e., the U.S. 200 mile Exclusive Economic Zone), the GSC will comply with any and all environmental mitigation measures required by the U.S. NMFS and/or the U.S. Fish and Wildlife Service.” The *St. Laurent* follows the lead of the *Healy*. The *Healy* breaks and clears ice approximately 1.6 to 3.2 km (1 to 2 miles [mi]) in advance of the *St. Laurent*. In situations where the array (and hydrophone streamer) cannot be towed safely due to ice cover, the *St. Laurent* may escort the *Healy*. The *Healy* uses a multi-beam echosounder (Kongsberg EM122), a sub-bottom profiler (Knudsen 3.5 kHz Chirp), and a “piloting” echosounder (ODEC 1500) continuously when underway and during the seismic profiling. Acoustic Doppler current profilers (75 kHz and 150 kHz) may also be used on the *Healy*. The *Healy*’s acoustic systems are described in further detail in Section VII and Appendix B of the IHA application.

In addition to the hydrophone streamer, marine sonobuoys are deployed to acquire wide angle reflection and refraction data for velocity determination to convert seismic reflection travel time to depth. Sonobuoys are deployed off the stern of the *St. Laurent* approximately every eight hours during seismic operations with as many as three deployments per day. The sonobuoy’s hydrophone activates at a water depth of approximately 60 m (196.9 ft) and seismic signals are communicated via radio to the *St. Laurent*. The sonobuoys are pre-set to scuttle (i.e., deliberately sink) eight hours after activation.

The program within U.S. waters consists of approximately 806 km (500.8 mi) of survey transect line, not including transits when the airguns are not operating (see Figure 1 and Table 1 of the IHA application). U.S. priorities include another 997 km (619.5 mi) of survey lines north of the U.S. Exclusive Economic Zone (EEZ), for a total of 1,804 km (1,121 mi) of tracklines of interest to the U.S. Table 1 of the IHA

application lists all U.S. priority tracklines; Figure 1 of the IHA application includes all U.S. priority tracks and the area of interest to Canada near the proposed U.S. tracklines. Water depths within the U.S. study area range from approximately 1,900 to 4,000 m (6,233.5 to 13,123.4 ft) (see Figure 1 of the IHA application). There may be additional seismic operations associated with airgun testing, start-up, and repeat coverage of any areas where initial data quality is sub-standard. The tracklines being surveyed in U.S. waters include the southern 263.8 km (164 mi) of the line that runs North-South in the western EEZ, the southern 264.5 km (164.4 mi) of the line that runs North—South in the central EEZ, and 277.7 km (172.6 mi) of trackline that connects the two (see Table 1 here and in Figure 1 of the IHA application). The IHA application requested the authorization of incidental takes of marine mammals for activities within U.S. waters. The survey line nearest to shore in U.S. waters is approximately 116 km (63 nmi) offshore at its closest point.

TABLE 1—U.S. PRIORITY TRACKLINES FOR USGS AND GEOLOGICAL SURVEY OF CANADA (GSC) 2010 EXTENDED CONTINENTAL SHELF SURVEY IN THE NORTHERN BEAUFORT SEA AND ARCTIC OCEAN

Location	End point 1	End point 2	Kilometer (km)	Nautical mile (nmi)	Time (Hour [hr]) @ 4 nmi/hr
NS in central EEZ (south)	71.22° North; 145.17° West	72.27° North; 145.41° West	118	64	16
NS in central EEZ (north)	72.27° North; 145.41° West	73.92° North; 145.30° West	183	100	25
Central-western EEZ connector.	73.92° North; 145.30° West	71.84° North; 151.82° West	317	171	43
NS in western EEZ	71.84° North; 151.82° West	74.32° North; 150.30° West	281	152	39
South Northwind Ridge	74.32° North; 150.30° West	74.96° North; 158.01° West	239	129	32
Northwind Ridge connector ...	74.96° North; 158.01° West	76.30° North; 155.88° West	161	87	22
Mid-Northwind Ridge	76.30° North; 155.88° West	75.41° North; 146.50° West	274	148	37
Northwind Ridge connector ...	75.41° North; 146.50° West	76.57° North; 146.82° West	129	70	17
Mid-Northwind Ridge	76.57° North; 146.82° West	76.49° North; 150.73° West	102	55	14
Totals			1,804	976	245

The two vessels operate cooperatively during the seismic survey. The *St. Laurent* conducts seismic operations using an airgun array and also operates a 12 kHz Chirp echosounder. The *St. Laurent* also operates a 3 to 5 kHz sub-bottom profiler in open water when not working with the *Healy*. The *Healy* normally escorts the *St. Laurent* in ice cover, and continuously operates a bathymetric multi-beam echosounder, a 3.5 kHz Chirp sub-bottom profiler, a piloting echosounder, and two acoustic Doppler current profilers.

The *St. Laurent* accessed the survey area from Canada and rendezvoused with the *Healy* on approximately August 10, 2010; the *Healy* approached the survey area from the Bering Straits. The *St. Laurent* deploys a relatively

small airgun array comprised of three G-airguns and a single hydrophone streamer approximately 300 m (984 ft) in length. The airgun array consists of two 500 in³ and one 150 in³ airguns for an overall discharge of 1,150 in³. The *St. Laurent* follows the lead of the *Healy* which operates approximately 1.9 to 3.8 km (1 to 2 nmi) ahead of the *St. Laurent*. In ice conditions where seismic gear cannot be safely towed, the *St. Laurent* escorts the *Healy* to optimize multi-beam bathymetry data collection. If extended open-water conditions are encountered, *Healy* and *St. Laurent* may operate independently. After completion of the survey the *St. Laurent* will return to port in Canada, and the *Healy* will change crew at Barrow via

helicopter or surface conveyance before continuing on another project.

Vessel Specifications

The CCGS *St. Laurent* was built in 1969 by Canadian Vickers Ltd. in Montreal, Quebec, and underwent an extensive modernization in Halifax, Nova Scotia between 1988 to 1993. The *St. Laurent* is based at CCG Base Dartmouth in Dartmouth, Nova Scotia. Current vessel activities involve summer voyages to the Canadian Arctic for sealifts to various coastal communities and scientific expeditions. A description of the *St. Laurent* with vessel specifications is presented in Appendix A of the IHA application and is available online at: <http://www.ccg->

gcc.gc.ca/eng/Fleet/Vessels?id=1111&info=5&subinfo.

The *Healy* is designed to conduct a wide range of research activities, providing more than 390.2 m² (4,200 ft²) of scientific laboratory space, numerous electronic sensor systems, oceanographic winches, and accommodations for up to 50 scientists. The *Healy* is designed to break 1.4 m (4.5 ft) of ice continuously at 5.6 km/hour (three knots) and can operate in temperatures as low as -45.6 C (-50 degrees F). The *Healy* is a USCG icebreaker, capable of traveling at 5.6 km/hour (three knots) through 1.4 m (4.5 ft) of ice. A "Central Power Plant," four Sultzer 12Z AU40S diesel generators, provides electric power for propulsion and ship's services through a 60 Hz, three-phase common bus distribution system. Propulsion power is provided by two electric AC Synchronous, 11.2 MW drive motors, fed from the common bus through a Cycloconverter system, that turn two fixed-pitch, four-bladed propellers.

The science community provided invaluable input on lab lay-outs and science capabilities during design and construction of the ship. The *Healy* is also a capable platform for supporting other potential missions in the polar regions, including logistics, search and rescue, ship escort, environmental protection, and enforcement of laws and treaties, and will also serve as the platform from which vessel-based Protected Species Observers (PSOs) will watch for marine mammals before and during airgun operations. Other details of the *Healy* can be found in Appendix A of the IHA application.

NMFS believes that the realistic possibility of a ship-strike of a marine mammal by the vessel during research operations and in-transit during the proposed survey is discountable. The probability of a ship strike resulting in an injury or mortality of an animal has been associated with ship speed; however, it is highly unlikely that the proposed seismic survey would increase the rate of injury, serious injury, or mortality given the *St. Laurent* and *Healy's* slow survey speed.

Acoustic Source Specifications— Seismic Airguns and Radii

The seismic source for the seismic survey is comprised of three Sercel G-

airguns with a total volume of 1,150 in³. The three-airgun array is comprised of two 500 in³ and one 150 in³ G-airguns in a triangular configuration (see Figure B-1 in the IHA application). The single 150 in³ G-airgun is used if a power-down is necessary for mitigation. The G-airgun array is towed behind the *St. Laurent* at a depth of approximately 11 m (36.1 ft) (see Figure B-2 in the IHA application) along predetermined lines in water depths ranging from 1,900 to 4,000 m (6,233.6 to 13,123.4 ft). One streamer approximately 232 m (761.2 ft) in length with a single hydrophone is towed behind the airgun array at a depth of approximately 9 to 30 m (29.5 to 98.4 ft).

A square wave trigger signal is supplied to the firing system hardware by a FEI-Zyfer GPStarplus Clock model 565, based on GPS time (typically at approximately 14 to 20 sec intervals). Vessel speed is approximately 10.2 km/hour (5.5 knots) resulting in a shot interval ranging from approximately 39 to 56 m (128 to 183.7 ft). G-airgun firing and synchronization are controlled by a RealTime Systems LongShot fire controller, which sends a voltage to the airgun solenoid to trigger firing with approximately 54.8 ms delay between trigger and fire point.

Pressurized air for the pneumatic G-airguns is supplied by two Hurricane compressors, model 6T-276-44SB/2500. These are air cooled, containerized compressor systems. Each compressor is powered by a C13 Caterpillar engine which turns a rotary screw first stage compressor and a three stage piston compressor capable of developing a total air volume of 600 SCFM @ 2,500 pounds per square inch (PSI). The seismic system is operated at 1,950 PSI and one compressor could easily supply sufficient volume of air under appropriate pressure.

Seismic acquisition requires a watchkeeper in the seismic lab and another in the compressor container. The seismic lab watchkeeper is responsible for data acquisition/recording, watching over-the-side equipment, airgun firing and log keeping. A remote screen permits monitoring of compressor pressures and alerts, as well as communication with the compressor watchkeeper. The compressor watchkeeper is required to

monitor the compressor for any emergency shut-down and provide general maintenance that might be required during operations.

Sound level radii for the proposed three airgun array were measured in 2009 during a seismic calibration (Mosher *et al.*, 2009; Roth and Schmidt, 2010). A transmission loss model was then constructed assuming spherical (20LogR) spreading and using the source level estimate 235 dB re 1 µPa (rms) 0-peak; 225 dB re 1 µPa (rms) from the measurements. The use of 20LogR spreading fit the data well out to approximately 1 km (0.6 mi) where variability in measured values increased (see Appendix B in the IHA application for more details and a figure of the transmission loss model compared to the measurement data). Additionally, the Gundalf modeling package was used to model the airgun array and estimated a source level output of 236.7 dB 0-peak (226.7 dB [rms]). Using this slightly stronger source level estimate and a 20LogR spreading the 180 and 190 dB (rms) radii are estimated to be 216 m (708.7 ft) and 68 m (223.1 ft), respectively. As a conservative measure for the proposed safety radii, the sound level radii indicated by the empirical data and source models have been increased to 500 m (1,640.4 ft) for the 180 dB isopleths and to 100 m (328 ft) of the 190 dB isopleths.

The rms received levels that are used as impact criteria for marine mammals are not directly comparable to the peak or peak-to-peak values normally used to characterize source levels of airguns. The measurement units used above to describe the airgun source, peak or peak-to-peak dB, are always higher than the rms dB referred to in much of the biological literature. A measured received level of 160 dB (rms) in the far field would typically correspond to a peak measurement of about 170 to 172 dB, at the same location (Greene, 1997; McCauley *et al.*, 1998, 2000). The precise difference between rms and peak or peak-to-peak values for a given pulse depends on the frequency content and duration of the pulse, among other factors. However, the rms level is always lower than the peak or peak-to-peak level for an airgun-type source.

TABLE 2—DISTANCES TO WHICH SOUND LEVELS GREATER THAN OR EQUAL TO 190, 180, AND 160 dB RE 1 μ Pa (RMS) COULD BE RECEIVED IN DEEP (GREATER THAN 1,000 M) WATER DURING THE SURVEY IN THE ARCTIC OCEAN, AUGUST 7, TO SEPTEMBER 3, 2010

Source and volume	Tow depth (m) ice/open water	Water depth	Predicted received RMS distances (m)		
			190 dB	180 dB	160 dB
Single Mitigation Airgun (150 in ³)	11/6–7	Deep (>1,000 m)	30	75	750
Three G-airguns (1,150 in ³)	11/6–7	Deep (>1,000 m)	100	500	2,500

Acoustic Source Specifications—Multibeam Echosounders (MBES), Sub-Bottom Profilers (SBP) and Acoustic Doppler Current Profilers (ADCP)

Along with the airgun operations, additional acoustic systems that are operated during the cruise include a 12 kHz Chirp echosounder and a 3–5 kHz SBP from the *St. Laurent*. The *Healy* operates a 12 kHz Kongsberg MBES, a Knudsen 320BR profiler, a piloting echosounder, and two ADCPs. These sources are operated throughout most of the cruise to map bathymetry, as necessary, to meet the geophysical science objectives. During seismic operations, these sources are deployed from the *St. Laurent* and the *Healy* and generally operate simultaneously with the airgun array deployed from the *St. Laurent*.

The Knudsen 320BR echosounder provides information on depth and bottom profile. The Knudsen 320BR is a dual-frequency system with operating frequencies of 3.5 and 12 kHz, however, the unit functions at the higher frequency, 12 kHz, because the 3.5 kHz transducer is not installed.

While the Knudsen 320BR operates at 12 kHz, its calculated maximum source level (downward) is 215 dB re μ Pa at 1 m. The pulse duration is typically 1.5 to 5 ms with a bandwidth of 3 kHz (FM sweep from 3 kHz to 6 kHz). The repetition rate is range dependent, but the maximum is a one percent duty cycle. Typical repetition rate is between $\frac{1}{2}$ s (in shallow water) to 8 s in deep water. A single 12 kHz transducer (sub-bottom) array, consisting of 16 elements in a 4x4 array will be used for the Knudsen 320BR. The 12 kHz transducer (TC-12/34) emits a conical beam with a width of 30°.

The 3–5 kHz chirp SBP is towed by and operated from the *St. Laurent* in open water when the *St. Laurent* is not working in tandem with the *Healy*. The SBP provides information about sedimentary features and bottom topography. The chirp system has a maximum 7.2 kW transmit capacity into the towed array. The energy from the towed unit is directed downward by an array of eight transducers in a conical

beamwidth of 80 degrees. The interval between pulses is no less than one pulse per second. SBPs of that frequency can produce sound levels 200 to 230 dB re 1 μ Pa at 1 m (Richardson *et al.*, 1995).

The Kongsberg EM 122 MBES operates at 10.5 to 13 (usually 12) kHz and is hull-mounted on the *Healy*. The transmitting beamwidth is 1° or 2° fore-aft and 150° athwartship. The maximum source level is 242 dB re 1 μ Pam (rms). Each “ping” consists of eight (in water greater than 1,000 m deep) or four (less than 1,000 m) successive fan-shaped transmissions, each ensonifying a sector that extends 1° fore-aft. Continuous-wave (CW) pulses increase from two to 15 ms long in water depths up to 2,600 m (8,530 ft), and FM chirp pulses up to 100 ms long are used in water greater than 2,600 m (8,530 ft). The successive transmissions span an overall cross-track angular extent of about 150°, with 2 ms gaps between pulses for successive sectors.

The Knudsen 320BR hydrographic SBP provides information on sedimentary layering, down to between 20 and 70 m (65.6 to 229.7 ft), depending on bottom type and slope. The Knudsen 320 BR is a dual-frequency system with operating frequencies of 3.5 and 12 kHz; only the low frequency is being used during this survey. At 3.5 kHz, the maximum output power into the transducer array, as wired on the *Healy* (where the array impedance is approximately 125 ohms), is approximately 6,000 watts (electrical), which results in a maximum source level of 221 dB re 1 μ Pa at 1 m downward. Pulse lengths range from 1.5 to 24 ms with a bandwidth of 3 kHz (FM sweep from 3 kHz to 6 kHz). The repetition rate is range dependent, but the maximum is a one percent duty cycle. Typical repetition rate is between $\frac{1}{2}$ s (in shallow water) to 8 s in deep water. The 3.5 kHz transducer array on the *Healy*, consisting of 16 (TR109) elements in a 4x4 array, is being used for the Knudsen 320BR. At 3.5 kHz the SBP emits a downward conical beam with a width of approximately 26°.

The piloting echosounder on the *Healy* is an Ocean Data Equipment

Corporation (ODEC) Bathy-1500 that provides information on water depth below the vessel. The ODEC system has a maximum 2 kW transmit capacity into the transducer and has two operating modes, single or interleaved dual frequency, with available frequencies of 12, 24, 33, 40, 100, and 200 kHz.

The 150 kHz ADCP has a minimum ping rate of 0.65 ms. There are four beam sectors and each beamwidth is 3°. The pointing angle for each beam is 30° off from vertical with one each to port, starboard, forward, and aft. The four beams do not overlap. The 150 kHz ADCP's maximum depth range is 300 m (984.3 ft).

The Ocean Surveyor 75 is an ADCP operating at a frequency of 75 kHz, producing a ping every 1.4 s. The system is a four-beam phased array with a beam angle of 30°. Each beam has a width of 4° and there is no overlap. Maximum output power is 1 kW with a maximum depth range of 700 m (2,296.6 ft).

Acoustic Source Specifications—Icebreaking

Icebreaking is considered by NMFS to be a continuous sound and NMFS estimates that harassment occurs when marine mammals are exposed to continuous sounds at a received sound level of 120 dB SPL or above. Potential takes of marine mammals may ensue from icebreaking activity in which the *Healy* is expected to engage outside of U.S. waters, i.e., north of approximately 74.1° North. While breaking ice, the noise from the ship, including impact with ice, engine noise, and propeller cavitation, will exceed 120 dB (rms) continuously. If icebreaking does occur in U.S. waters, USGS expects it will occur during seismic operations. The exclusion zone (EZ) for the marine mammal Level B harassment threshold during the proposed seismic activities is greater than the calculated radius during icebreaking. Therefore, if the *Healy* breaks ice during seismic operations within the U.S. waters, the greater radius, i.e., that for seismic operations, supersedes that for icebreaking, so no

additional takes have been estimated within U.S. waters.

Dates, Duration, and Specific Geographic Area

The seismic survey is being conducted for approximately 36 days from approximately August 2 to September 6, 2010. The approximately 806 km (501 mi) of tracklines within U.S. waters will be surveyed first. These survey lines are expected to be completed by approximately August 19, 2010. The seismic vessel *St. Laurent* departed from Kugluktuk, Nunavut, Canada on August 6, 2010 and returned to the same port on approximately September 15, 2010. The *Healy* departed from Dutch Harbor, Alaska on August 2, 2010, to meet the *St. Laurent* on August 10, 2010. After completion of this survey, the *Healy* is changing crew

through Barrow via helicopter or surface vessel on September 6, 2010 (see Table 3 of the IHA application). The entire survey area will be bounded approximately by 145° to 158° West longitude and 71° to 84° North latitude in water depths ranging from approximately 1,900 to 4,000 m (6,234 to 13,123 ft) (see Figure 1 and Table 1 of the IHA application). Ice conditions are expected to range from open water to 10/10 ice cover. See Table 3 of the IHA application for a synopsis of the 2010 *St. Laurent* and *Healy* Extended Continental Shelf expeditions in the Arctic Ocean, August 2 to September 15, 2010.

Icebreaking outside U.S. waters will occur between the latitudes of approximately 74° to 84° North. Vessel operations and ice conditions from

similar survey activities and timing in 2008 and 2009 were used to estimate the amount of icebreaking (in trackline km) that is likely to occur in 2010. USGS expects that the *St. Laurent* and the *Healy* will be working in tandem through the ice for a maximum of 23 to 25 days while outside of U.S. waters. The average distance travelled in 2008 and 2009 when the *Healy* broke ice for the *St. Laurent* was 135 km/day (83.9 mi/day). Based on the 23 to 25 day period of icebreaking, USGS calculated that, at most approximately 3,102 to 3,372 km (1,927.5 to 2,095.3 mi) of vessel trackline may involve icebreaking. This calculation is likely an overestimation because icebreakers often follow leads when they are available and thus do not break ice at all times.

TABLE 3—PROJECTED 2010 ICEBREAKING EFFORT FOR USGS/GSC 2010 EXTENDED CONTINENTAL SHELF SURVEY IN THE NORTHERN BEAUFORT SEA AND ARCTIC OCEAN

	Two-Ship operations (days)	Two-Ship operations (km)	km/day
2008	19	2,469	130
2009	27	37,744	140
Average 2008 to 2009	23	3,122	135
Projected 2010	23–25	3,102–3,372	

Comments and Responses

A Notice of Receipt of the USGS application and proposed IHA was published in the **Federal Register** on July 8, 2010 (75 FR 39336). During the comment period, NMFS received comments from the Marine Mammal Commission (Commission), the North Slope Borough (NSB) Office of the Mayor, and the Alaska Eskimo Whaling Commission (AEWC). The public comments can be found online at: <http://www.nmfs.noaa.gov/pr/permits/incidental.htm>. The following are their comments, and NMFS's responses.

Comment 1: The Commission recommends that NMFS approve the requested IHA, provided NMFS ascertain who will be responsible for operating the Canadian vessel and the airguns and other instruments deployed from the *St. Laurent* and issue an IHA for these activities only if a U.S. agency or U.S. citizen(s) will be conducting those operations.

Response: USGS's EA has clarified the roles and responsibilities of the Canadian vessel *St. Laurent* while operating within and outside U.S. waters:

"The activity that the USGS is funding and undertaking in both the U.S. waters (maritime zones) and the high seas is to

collect multi-beam, associated chirp sub-bottom data, and possibly sediment and rock samples both within and outside the 370.4 km (200 nmi) limit, as well as to break ice for the *St. Laurent* during operations in ice-covered area. The *St. Laurent* is a vessel entitled to sovereign immunity under international law, operated by the CCG with a seismic system owned and operated by Natural Resources Canada, and therefore not under the jurisdiction of U.S. laws or regulations outside the U.S. maritime zones where the U.S. has exclusive rights and jurisdiction. The USGS is acting as the responsible agency for MMPA, ESA, and NEPA for the *St. Laurent* while the *St. Laurent* is collecting seismic data within the U.S. EEZ. The operators of the seismic equipment on the *St. Laurent* have written a Categorical Declaration that, for operations in U.S. waters (i.e., within the U.S. EEZ), they will comply with any and all environmental mitigation measures required by NMFS and/or the U.S. Fish and Wildlife Service (USFWS) (see Appendix C of the EA). There are no U.S. Federal funds that are supporting the costs of operating *St. Laurent*, or its seismic gear" (see p. 2 to 3 of the EA).

The GSC is collecting seismic data in U.S. waters at the request of the U.S. and would not otherwise be operating in U.S. waters. Dr. Jonathan Childs, USGS liaison aboard the *St. Laurent*, will be responsible for establishing the start and end points of the lines within U.S. waters and for compliance with conditions of the IHA. The Categorical Declaration from Natural Resources Canada, United Nations Convention on the Law of the Sea (UNCLOS) Program (see p. 116 in Appendix C of the EA) further states:

"While in U.S. waters (i.e., the U.S. EEZ), the GSC operators will comply with any and all environmental mitigation measures required by the NMFS and/or USFWS. A NMFS approved PSO and a U.S. liaison aboard the *St. Laurent* will be responsible for ensuring that all mitigation measures required by NMFS and/or USFWS are implemented while the *St. Laurent* operates in U.S. waters."

"While operating in U.S. waters, the GSC operators of the seismic profiling system categorically consent to comply with all applicable U.S. laws, including the MMPA and the ESA, as well as any terms and conditions that may be required under an IHA issued by NMFS and any measures that may arise from

ESA consultations with NMFS and/or USFWS. Operation of the seismic profiling system includes conditions under which the system will be turned on and operation continued or ceased in the presence of marine mammals (including polar bears), and the diversion of scientific tracklines for avoidance of observed wildlife. This declaration should in no way be constructed to influence or alter the safe operation of the vessel which is at the sole discretion of the CCG and its Commanding Officer.”

Comment 2: The Commission recommends that NMFS approve the requested IHA, provided NMFS work with the applicant to re-estimate exposures for ice-breaking activities based upon the total area that may be exposed to sound levels greater than or equal to 120 dB re 1 μ Pa (rms).

Response: The Commission's concerns are that the USGS application states that an area of water 4,109 km² (1,586.5 mi²) will be exposed to sound levels $\geq$ 120 dB re 1 μ Pa (rms) but that the marine mammal “takes” are estimated using a larger number of 5,137 km² (1,983.4 mi²) to allow for turns, repetition of certain tracklines because of poor data quality or minor changes in survey design (this larger number represents an uncertainty estimate of approximately 20 percent). A critical clarification is that the 4,109 km² and 5,137 km² numbers are for estimating the area of takes within U.S. waters based on seismic operations, using a radius of approximately 2,500 m (8,202 ft) (see page 69 of the EA) for the $\geq$ 160 dB re 1 μ Pa (rms) isopleths, and not on the area ensonified by continuous noise of icebreaking at $\geq$ 120 dB re 1 μ Pa (rms). This approach was taken because the area of take for the seismic source $\geq$ 160 dB re 1 μ Pa (rms), estimated at approximately a 2,500 m (8,202 ft) radius was greater than that estimated for $\geq$ 120 dB re 1 μ Pa (rms) of continuous sound from icebreaking, estimated at 1,750 m (5,741.5 ft) radius (see page 213 of the EA). The estimated area ensonified for icebreaking outside of U.S. waters is 11,802 km² (4,556.8 mi²) (see p. 213 of the EA).

A point of confusion in this clarification is that the original request from NMFS was to estimate takes from icebreaking, rather than the total area exposed to sound levels $\geq$ 120 dB re 1 μ Pa (rms). The addendum on icebreaking (see Appendix J of the EA) only estimated takes for the *Healy* breaking ice outside of U.S. waters because there would be no additional takes for the sound of icebreaking within U.S. waters beyond those estimated for the seismic source.

One can calculate the area of potential icebreaking within U.S. waters by using the estimated track length (approximately 806 km [500.8 mi], page 69 of the EA) and the $\geq$ 120 dB μ Pa (rms) radius, estimated at 1,750 m (5,741.5 ft) (see page 213 of the EA), to get an ensonified area of 2,821 km² (1,089.2 mi²), which, with an additional uncertainty estimate of 20 percent totals 3,385 km² (1,307 mi²). This number is still smaller than either the 4,109 km² or 5,137 km² numbers cited in the comments from the Commission.

It is important to also clarify that (a) the USGS estimated icebreaking assuming that maximum noise of icebreaking would occur along the total length of tracklines. The preferred strategy operating in the ice is to follow leads whenever possible, which reduces the total icebreaking effort. Canadian and U.S. ice observers and analysts are aboard both vessels to select paths through the ice to minimize icebreaking; (b) for some part of the cruise, depending on ice conditions, the *St. Laurent* will be leading *Healy* so that high-quality multi-beam data can be collected, further reducing the amount of icebreaking the *Healy* will be doing (and therefore reducing the area of ensonification for $\geq$ 120 dB re 1 μ Pa [rms]). The estimates of the area of ensonification in the EA and IHA do not include a correction for this type of data acquisition. Hence the area of ensonification is likely to be overestimated; (c) the tracklines are laid out to enable flexibility in where the ship may navigate through the ice, maximizing the opportunities to follow leads and reduce the requirement for icebreaking and therefore minimize the noise of icebreaking. Under international law as reflected in Article 76 of UNCLOS, the ECS outer limit points are to be no more than 111.1 km (60 nmi) apart. The cruise tracks are planned 92.6 km (50 nmi) apart or less so that the vessels can deviate approximately 18.5 km (10 nmi) either side of the track to follow leads; and (d) based on the latest ice imagery for August 3, 2010, there will probably be no need to break ice within U.S. waters.

As of August 3, 2010, <http://arctic.atmos.uiuc.edu/cryosphere/NEWIMAGES/arctic.seaice.color.000.png> shows the ice extent in the area north of the Alaska coast to be mostly open water. The PSOs aboard the *Healy* will be monitoring actual takes from icebreaking during the cruise, which can be compared with takes estimated and authorized in the IHA.

Comment 3: The Commission recommends that NMFS approve the

requested IHA, provided NMFS advise the applicant to consult with the USFWS regarding the need for a separate incidental taking authorization for walrus and polar bears.

Response: On May 7, 2010, USGS requested that the USFWS review the operations for the summer 2010 Arctic Ocean geophysical experiment for potential impacts on Pacific walrus and polar bears. Given the USFWS's understanding of polar bear and walrus distribution, the planned travel routes and locations of the activity, the USFWS believe that it is unlikely the proposed studies will result in any major disturbances or impacts to individual polar bears or walrus. Considering the relatively low likelihood of encountering polar bears or walrus, along with the limited impact and anticipated responses of affected animals that would likely ensue from an encounter with either or both vessels, the USFWS has determined that an incidental take authorization is not necessary for this project. See the USFWS's informal ESA Section 7 consultation letter regarding walrus and polar bears in Appendix E of the EA (p. 128 to 132).

Comment 4: The Commission recommends that NMFS approve the requested IHA, provided NMFS provide additional justification for its preliminary determination that the planned monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion zones (EZs). At a minimum, such justification should (1) identify those species that it believes can be detected with a high degree of confidence using visual monitoring only, (2) describe detection probability as a function of distance from the vessel, (3) describe changes in detection probability under various sea state and weather conditions and at night, and (4) explain how close to the vessel marine mammals must be for observer to achieve the anticipated high nighttime detection rate.

Response: NMFS believes that the planned monitoring program will be sufficient to visually detect, with reasonable certainty, most marine mammals within or entering identified EZs. This monitoring, along with the required mitigation measures, will help ensure the authorized taking effects the least practicable adverse impact on the affected species or stocks and will have a negligible impact on the affected species or stocks.

Until proven technological advances are made, nighttime mitigation measures during operations include combinations of the use of PSOs and

night vision devices (NVDs). Should the airgun array be powered-down, it is believed that the operation of a single airgun continues to serve as a sound source deterrent to marine mammals. In the event of a complete shut-down of the airgun array, for mitigation or repairs, airgun operations are suspended until nautical twilight-dawn (when PSOs are able to clear the EZ). Airgun operations do not begin until the entire EZ radius is visible for at least 30 minutes. In all likelihood there will be no nighttime start-ups for the time that the seismic data are collected in U.S. waters (mid-August), when 24 hour daylight is still occurring.

Comment 5: The Commission recommends that NMFS approve the requested IHA, provided NMFS clarify the meaning of the qualifiers “when practical,” “if practical,” and “when feasible” to indicate how often and under what specific conditions the applicant expects to use (1) two Protected Species Observer (PSOs) to monitor the EZ for marine mammals during daytime operations and nighttime start-ups of the airguns, (2) crew members to assist PSOs in detecting marine mammals and implementing mitigation requirements, and (3) PSOs during daytime periods to compare sighting rates and animal behavior during times when seismic airguns are and are not operating.

Response: The *St. Laurent* and *Healy* will carry trained, NMFS-qualified and experienced PSOs for the seismic study involving the use of airguns and icebreaking for the upcoming proposed project. PSOs are appointed by USGS with NMFS concurrence. USGS will utilize vessel-based PSOs to watch for and monitor marine mammals near the icebreaking and seismic source vessels during all daytime airgun operations and before and during start-ups of the airguns day or night. PSOs will have access to reticle binoculars and NVDs to scan the area around each vessel. PSOs will alternate between binoculars and the naked eye to avoid eye fatigue. During all monitoring periods, PSOs will be on duty from observation locations that allow for optimal monitoring capabilities. During meal times and restroom breaks it is sometime difficult to have the full complement of PSOs on effort, but at least one PSO will be on watch during those brief times. The complement of PSOs rotates shifts, with duty shift lasting generally one to four hours.

Regarding the Commission’s sub-comment (1), the intention and requirement is for two PSOs to stand watch during all seismic operations in U.S. waters, including cold start and

ramp-ups. Only one PSO is on watch during daylight non-seismic operations. Two U.S. PSOs will join the *St. Laurent* before seismic operations begin in U.S. waters so that there will be five PSOs aboard the *St. Laurent* for all seismic data collected in U.S. waters. The restriction on the U.S. PSOs not standing watch for more than four hours at a time and the as yet unknown schedules of the Canadian watches makes actual schedules at this time unknown, hence the qualifiers “when practical,” etc., are used to account for this uncertainty. There may also be short periods of time, for example during mandatory fire and boat safety drills, when the PSOs on watch must leave their observing stations. It is the responsibility of the U.S. liaison aboard the *St. Laurent* working with the Canadian counterparts to develop a watch schedule consistent with the requirements of the IHA, especially for the ramp-ups, whether during the day or night. In all likelihood there will be no nighttime start-ups for the time that the seismic data are collected in U.S. waters (mid-August), when 24 hour daylight is still occurring.

Canada will follow its own permitting requirements for watches and start-ups when operating outside of U.S. waters. The two U.S. PSOs aboard the *St. Laurent* during the time the *St. Laurent* is in U.S. waters will return to the *Healy* after the U.S. waters portion of the survey is completed and stand watch on the *Healy* to aid in sighting marine mammals and alert the PSOs aboard the *St. Laurent* of their sightings during the two ships’ operations.

Regarding the Commission’s sub-comment (2), the qualifiers to this condition refer to the situations in which (a) other members of the ship’s or scientific crew on either vessel notice a marine mammal near the vessel and report it to the bridge or the PSOs; (b) the bridge watch can assist in marine mammal observations during the night when the PSO is not required to be on the bridge; or (c) the bridge watch aboard the *Healy* (in the steering station above the bridge, which is the highest and best vantage point for making observations) sees marine mammals. It is impossible to predict the frequency that these situations will occur, only that many more eyes are available to spot marine mammals than those of the PSOs, and that these additional eyes should be used whenever possible, practical, or feasible. It is not the intention in any of these situations for the crew or the bridge to implement mitigation requirements because that authority is with the PSOs. However, the bridge often acts as a central point

of communication among science crew, ship’s crew, and PSOs, and therefore plays a vital role in ensuring that the PSOs can implement appropriate mitigation procedures at the appropriate times.

Regarding the Commission’s sub-comment (3), the U.S. PSOs aboard the *Healy* (or when aboard the *St. Laurent*) will be on watch collecting marine mammal observation data whether the airguns are operating or not. When the *Healy* is operating independently of the *St. Laurent* (e.g., steaming north from Dutch Harbor or for operations at the beginning of the survey when in open water—and therefore independently surveying), the data collected by the PSOs is baseline data. For the seismic survey within U.S. waters, the *St. Laurent* will be steaming to the start of the tracks from the east and will have the U.S. PSOs aboard to record baseline observations during the steaming time. Both U.S. and Canadian observers will be recording baseline information for at least 30 min on site prior to initial start-up and ramp-ups of the airgun operations during the survey. If the *St. Laurent* is operating independently in either international or Canadian waters, it is the responsibility of the Canadian Chief Scientist, using the conditions set forth in the Canadian permits to determine whether the Canadian observers will stand watch to collect baseline information. When the ships are operating together in international or Canadian waters, the PSOs aboard the *Healy* will be making observations either in front of the *St. Laurent* (during seismic operations) or behind the *St. Laurent* (during multi-beam operations). It is neither practical nor economical to pre-survey all tracks for the presence of marine mammals (and baseline behavior) prior to conducting seismic operations because of the huge area covered by the joint expedition, so the most likely baseline information to be collected will be at breaks in lines for repair or maintenance of the seismic gear and at the start of the survey. Using the experience of 2008 and 2009, halts in seismic acquisition for equipment maintenance generally occurred every 48 to 72 hours and lasted from 6 to 48 hours. Marine mammal observations made aboard the *Healy* cruise will allow the PSOs to collect baseline information whenever the seismic equipment is not operating.

Comment 6: The Commission recommends that NMFS approve the requested IHA, provided NMFS propose to USGS that it revise its study design to collect meaningful baseline data on sighting rates for marine mammals. Such information is essential for a

realistic assessment of impacts from the proposed activities and recovery from those impacts.

Response: NMFS is unclear about the Commission's recommendation regarding the revision of USGS's "study design." Please clarify if you are referring to USGS overall study design or more specifically to the monitoring plan required under the MMPA. The purpose of the USGS's project is for marine geophysical research, not to conduct a dedicated marine mammal research survey. Extending the survey is not practicable from an operational standpoint for the applicant. Due to the remote location of the survey and the length of time needed to conduct the requested science experiment, there may be little time left for the vessel to operate without the need for refueling and servicing.

During the cruise, there will be significant amounts of transit time pre- and post-survey during which PSOs will be on watch (e.g., prior to and after the seismic portions of the survey). The collection of this observational data by PSOs may provide meaningful baseline data for marine mammals, but it is unlikely that the information would result in any statistically robust conclusions for this particular seismic survey. See NMFS responses to comments above.

To augment detection and baseline observations, the U.S. liaison aboard the *St. Laurent* will request that prior to the start of seismic activities in U.S. waters, the GSC operators deploy a sonobuoy that can be monitored through an audio channel for the presence of whales for at least the 30 min time period that the vessel is on site before commencing seismic operations. Detected vocalizations can be used to augment visual observations. The sonobuoy audio information is only intended to be used to identify the presence or absence of animals because the relative direction and distance to vocalizing animals cannot be determined from these sounds. The sonobuoy information is not intended to be used for mitigation purposes. As stated in the IHA, seismic operations will not begin if any bowhead whales are seen or heard. Use of sonobuoys is contingent upon concurrence by GSC operators, who are generally supportive of collecting additional data in support of marine mammal observations.

In addition, USGS proposes that the sonobuoy data from the refraction part of the experiment will be made available to an appropriate biologist or acoustician for analysis for the presence of marine mammals. The data is recorded continuously for

approximately eight hours, and the sonobuoy records sounds not only from the airguns, but ambient noise and any other sounds long after the vessel has left the area. Although no noise trains that might be interpreted as marine mammal sounds have been definitively identified on the sonobuoys examined during 2008 and 2009 joint expeditions (Chian, pers. comm.), the sonobuoys are a source of information available for closer scrutiny.

Comment 7: The Commission recommends that NMFS approve the requested IHA, provided NMFS require the applicant to collect information to evaluate the assumption that 160 dB re 1 μ Pa (rms) is the appropriate threshold at which harassment occurs for all marine mammals in the survey area. This assumption can and should be tested using in-situ measurements of sound propagation concurrent with observations of the responses of marine mammals exposed to such sounds. Such tests should be conducted using species-specific data, and test results should be used to inform decision makers regarding the applicability of the 160 dB re 1 μ Pa (rms) threshold for specific species and to improve future mitigation measures.

Response: Behavioral responses to sound are context specific and can vary by species and other factors. However, there are not currently enough species-specific data showing how marine mammals respond to sound to support the development of separate harassment thresholds for every species. Therefore, NMFS uses the best available applicable data, which includes studies of several different species, to predict at what levels marine mammals are likely to be harassed and NMFS believes that the 160 dB re 1 μ Pa (rms) threshold remains appropriate for the species in this project area.

Regarding testing these behavioral harassment assumption, NMFS primarily relies on scientific research advances, and applicable monitoring results (where appropriate) to inform them. Behavioral response field studies that are able to definitively track what an animal is doing for some period of time (a baseline), expose it to a known received sound level, and record its behavior afterwards until it goes back to baseline are expensive and challenging to execute and while a few are currently underway, relatively few have been completed. Separately, in required monitoring measures, PSOs are required to make behavioral observations during seismic activities, however, while they can very effectively detect a marine mammal, identify it, and record its behavior at the surface for the moments

that it is within view of the moving vessel—this information is typically not enough to support the development of a harassment threshold. Alternatively, there has been one longer-term (i.e., associated with a five year rulemaking) monitoring study that has generated numerous data of a robust and measureable nature through the deployment of an extensive hydrophone array.

Regarding bowhead whales specifically, some published articles indicate that they may avoid seismic vessels at levels below 160 dB (rms), NMFS does not believe that these responses rise to the level of a take. Miller *et al.* (1999) indicated that some bowhead whales may have started to be deflected from their migratory path at 35 km (21.7 mi) from the seismic vessel, during migration, however, as described in MMS' 2006 Final Programmatic Environmental Assessment (PEA), this response has not been seen at other times of the year and during other activities. To show the contextual nature of this minor behavioral modification, recent monitoring studies of Canadian seismic operations indicated that feeding, non-migratory bowhead whales do not move away from a noise source at an SPL of 160 dB. NMFS therefore continues to estimate "takings" under the MMPA from impulse noises, such as seismic, as occurring at 160 dB (re 1 μ Pa [rms]).

Comment 8: The Commission recommends that NMFS approve the requested IHA, provided NMFS require the applicant to make observations during all ramp-up procedures to gather the data needed to analyze and report on their effectiveness as mitigation. As it has noted in past correspondence, the Commission would be pleased to discuss with NMFS the collection and analysis of such data and the design of such experiments to promote a better understanding of the utility and shortcomings of ramp-up as a mitigation measure.

Response: The IHA requires that PSOs on the *St. Laurent* and *Healy* make observations for 30 min prior to ramp-up, during all ramp-ups, and during all daytime seismic operations and record the following information when a marine mammal is sighted:

(i) Species group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic vessel, sighting cue, apparent reaction to the airguns or vessel (e.g., none, avoidance, approach, paralleling, etc., and including responses to ramp-up), and behavioral pace; and

(ii) Time, location, heading, speed activity of the vessel (including number of airguns operating and whether in state of ramp-up or power-down), Beaufort wind force and sea state, visibility, and sun glare.

One of the primary purposes of monitoring is to result in “increased knowledge of the species” and the effectiveness of monitoring and mitigation measures; marine mammal reactions to ramp-up would be useful information in this regard. NMFS has asked USGS to gather all data that could potentially provide information regarding the effectiveness of ramp-ups as a mitigation measure. However, considering the low numbers of marine mammal sightings and low number of ramp-ups, it is unlikely that the information will result in any statistically robust conclusions for this particular seismic survey. Over the long term, these requirements may provide information regarding the effectiveness of ramp-up as a mitigation measure, provided animals are detected during ramp-up.

A study investigating the efficacy of ramp-up has been jointly funded by the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE) and the Joint Industry Programme (JIP). Post-cruise monitoring reports for numerous seismic surveys are currently available on the NMFS MMPA Incidental Take Program Web site should there be interest in further analysis of this data by the public.

Comment 9: The NSB and its residents as well as the AEWC are concerned about potential health impacts to the environment associated with offshore development (i.e., industrial and commercial activities) on the North Slope. Activities allowed by the proposed authorization pose direct, indirect, and cumulative impacts on species (especially marine mammals) that are critical to the subsistence harvesting villages the AEWC represents and the NSB people’s subsistence harvest.

Response: NMFS is unclear about the specific meaning of the term “health impacts” as used in the public comments. The USGS and NMFS are making every effort to minimize the direct, indirect, and cumulative impacts through the federal NEPA, MMPA, and ESA process, as well as consulting with the Native communities. Cumulative impact assessments are USGS and NMFS responsibility under NEPA. The revised EA has addressed concerns about potential impacts using the best available science. In evaluating the severity of the impacts, it is important to realize that the proposed seismic

activity within the U.S. EEZ is more than 100 km (54 nmi) offshore in a region well away from the main migration routes of the bowhead whale and will occur at a time prior to the bowhead whales beginning their fall migration from the Canadian Beaufort. Although a single individual bowhead whale has been identified in this region from tagging, there is little evidence to suggest that the location or timing of the survey overlaps with or interferes with bowhead whaling activities. As noted in the EA, “available information * * * does not indicate that marine and seismic surveys for oil and gas exploration activities has had detectable long-term adverse population-level effects on the overall health, current status, or recovery of marine mammal species and populations in the Arctic region. For example, data indicated that the Bering-Chukchi-Beaufort (BCB) bowhead whale population has continued to increase over the timeframe that oil and gas activities have occurred. There is no long-term displacement from habitat (although studies have not specifically focused on addressing this issue) * * * monitoring studies indicate that most fall migrating whales avoid an area with a radius of about 20 to 30 km (12.4 to 18.6 mi) around a seismic vessel operating in nearshore waters (Miller *et al.*, 2002). USGS is not aware of data, however that indicate that such avoidance is long-lasting after cessation of the activity” (EA, p. 81 to 82). Seismic survey activities in the Canadian and Russian Arctic occur in different geographical areas, therefore, they are not analyzed.

NMFS does not allow activities in the Arctic, NMFS only authorizes the take of marine mammals incidental to an otherwise legal specified activity in a specified geographic area.

Comment 10: The NSB is concerned that NSB communities are being overwhelmed by multiple planning processes both because of the constraints on time and expertise of communities and individuals and because of the seeming inability to meaningfully influence the decisions being made.

Response: It is unfortunate that the NSB communities feel overwhelmed by the multiple planning processes, time constraints, and other issues. Because of the statutory timelines associated with the MMPA IHA process (which include the 30-day public review period), NMFS is also forced to work within challenging time constraints. However, NMFS has encouraged Arctic applicants to apply earlier than required by the regulations, which allows NMFS, NSB, BOEMRE, and the affected communities

time to review the applications prior to meeting in Spring at the Open Water Meeting to discuss the applications. If the NSB has process recommendations that could make things easier for the communities while still allowing NMFS to meet our regulatory requirements, NMFS would be glad to discuss them. Separately, NMFS makes every effort to incorporate input from the NSB communities, where appropriate given our regulatory requirements.

USGS included a statement about environmental justice in the EA, “the proposed action complies with EO 12898, Federal Actions to Address Environmental Justice in Minority and Low-income Populations and EO 13045, Protection of Children from Environmental Health Risks and Safety Risks. USGS solicited public comment on their Draft EA and published a Notice of Availability in the **Federal Register** on June 11, 2010 (75 FR 33326). NMFS published a Notice of Receipt of the USGS application and proposed IHA in the **Federal Register** on July 8, 2010 (75 FR 39336). The public comments were considered by USGS in developing the EA and by NMFS in developing the IHA. “As part of its Plan of Cooperation, USGS is hiring an Alaska native to be a member of the science crew, serve as an observer, and provide communication with the subsistence communities.”

Comment 11: The NSB and AEWC recognize the efforts made by the USGS to meet with representatives of their communities and to provide information on the proposed seismic survey work planned for this summer. The AEWC appreciate the opportunity to receive information directly from the Federal agency planning the activities, and those efforts have helped to provide the AEWC with a better understanding of the proposed seismic surveys. The AEWC looks forward to further dialogue in the future should the Federal government continue with similar work in the Arctic, AEWC wishes to emphasize that, given the willingness of the USGS to work with the AEWC. The NSB and AEWC do no object to the issuance of an IHA for these operations, despite the serious process concerns raised in their public comments.

Response: NMFS has issued an IHA to USGS for conducting a marine seismic survey in the Arctic Ocean from August to September, 2010, which includes the mitigation, monitoring, and reporting requirements described below.

Comment 12: The NSB and AEWC objects to the ongoing flawed public process employed by the NMFS Office of Protected Resources (OPR), in which it purports to accept and consider

public comment (from local communities in regulating activities in the Arctic) on requests for Incidental Harassment Authorizations and in regulating activities in the Arctic. The AEWC strenuously objects to a public comment process that fails to provide an opportunity for meaningful input before the activities are scheduled to occur. Congress intended that the local impacted communities have an opportunity to provide substantive feedback to the Federal government before decisions are made and before any harassment takes place. The AEWC states that the people on the North Slope feel like they have no opportunity to influence government decisionmaking and therefore do not feel like NMFS' decisions reflect the interests or input of the local whaling captains, who have invaluable observations and direct experience, developed over hundreds of generations, to offer.

This particular case provides a stark example of how and why OPR's process is flawed to the point of being irrelevant for the local impacted communities on the North Slope and must be wholly reformulated. The AEWC states that these issues have plagued OPR's program for years, and despite many lessons learned in the offshore context over the past several years, nothing at OPR has changed for the better. The AEWC welcomes the opportunity to work with OPR leadership to improve upon this important regulatory program if NMFS and OPR are willing to make substantive changes to ensure adequate public participation and adequate protection of their local communities and the marine mammals upon which they depend.

Response: In order to issue an authorization pursuant to Section 101(a)(5)(D) of the MMPA, NMFS must determine that the taking by harassment of small numbers of marine mammals species or stocks will have a negligible impact on affected species or stocks, and will not have an unmitigable adverse impact on the availability of affected species or stocks for taking for subsistence uses. If NMFS is able to make these findings, the Secretary is required to issue an IHA. As required by the MMPA and its implementing regulations, NMFS published a Notice of Receipt of the USGS application and proposed IHA in the **Federal Register** on July 8, 2010 (75 FR 39336). All substantive public comments were considered by NMFS in developing the IHA and responses to those public comments can be found here in this notice. NMFS determined that it was

able to make the required MMPA findings.

For many years, NMFS has conducted the Arctic Open Water Meeting, which brings together the Federal agencies, the oil and gas industry, and affected Alaska Native organizations to discuss the proposed activities and monitoring plans. Local and traditional knowledge is considered at these times, and it is not too late for that knowledge to serve a useful purpose. These communities are also afforded an opportunity to submit comments on the IHA application and proposed IHA notice, which are then considered by NMFS before making a final determination on whether or not to issue an IHA.

Comment 13: The AEWC states that in implementing the MMPA, NMFS has done everything in its power to gut Congress' expressed intent to provide meaningful public participation. The way in which NMFS sequences the IHA applications and the public notices renders the public comment process ineffective and irrelevant for NMFS's decision-making process.

The NSB and AEWC state that in this action the proposed seismic activities were scheduled to begin at least two days before the public comment period closed. NMFS requested that comments be received by August 9, 2010, and the agency then supposedly has 45 days within which to analyze the comments and issue a final IHA. In the **Federal Register** notice, however, NMFS clarifies that USGS's two ships intend to rendezvous in the survey area on August 7, 2010. The obvious problem is that the ships have been deployed, the crews have been informed of their operational restrictions, and seismic activities have likely commenced before NMFS receives public comment or issues the final IHA. As a result, the AEWC cannot possibly provide meaningful input into the operations or how they should be regulated. While the AEWC are being forced to write detailed comments on a lengthy IHA application and **Federal Register** notice, the ships are already out in the water adding noise to the marine environment and transiting the Chukchi Sea. The AEWC states that it is absolutely insulting for the activities to commence before the public comment deadline has even been closed.

The AEWC states that it is readily apparent from this sequencing that NMFS is actually allowing the USGS to operate without an IHA (or simply looking the other way) during a significant portion of the planned activities. Based on past experiences, it has taken NMFS several weeks to review public comments and issue a

final IHA. Here, USGS plans to operate during August and September, and yet the public comment period did not close until August 9. It's very likely in this situation that USGS will therefore complete a majority of its planned operations before even receiving from NMFS the actual IHA, which spells out specific mitigation requirements such as monitoring of EZs and shut-down and ramp-up procedures. In its responses to comments, the AEWC requests explicit clarification from NMFS on whether and to what extent NMFS knew of or allowed USGS to conduct seismic activities before the IHA was issued. The AEWC also requests explicit clarification on whether USGS or NMFS was in violation of any provisions of the MMPA as a result.

Response: NMFS received a revised IHA application from USGS that was deemed adequate and complete on June 1, 2010. NMFS published a Notice of Receipt of the USGS application and proposed IHA in the **Federal Register** on July 8, 2010 (75 FR 39336), but due to the close of the 30 day public comment period falling on a weekend, the closing date was calculated as August 9, 2010 in the **Federal Register**. USGS was notified of the delayed closing date by NMFS. While it usually takes several weeks to address public comments, NMFS worked especially diligently to review and consider the comments in a timely manner such that NMFS could make a final decision in a time frame that would allow USGS and GSC to conduct the proposed seismic operations if NMFS did issue an IHA. NMFS does not authorize USGS to conduct seismic activities, NMFS authorizes the take of marine mammals incidental to an otherwise legal specific activity in a specified geographic area.

While beginning seismic work in the U.S. EEZ on approximately August 7, 2010, was the optimum plan for the two-icebreaker experiment, experiments this large always have contingency plans for unexpected conditions (such as weather, ice conditions, equipment maintenance, ship maintenance, other emergencies, etc.). In the case of this experiment, the *St. Laurent* had approximately 10 days of work planned inside the Canadian EEZ after the two-icebreaker experiment ended. This Canadian survey work was started to account for the delay in obtaining the IHA. Likewise, the *Healy* had contingency multi-beam survey work planned on the Beaufort margin that could be conducted independently of the *St. Laurent* in case open water would allow the vessels to operate independently. The *Healy* began this work and continued doing this survey

work until the *St. Laurent* entered the ice on her way north. The *Healy* and *St. Laurent* did not begin any activities that NMFS believes would result in the potential take of marine mammals until after they received the IHA on August 11, 2010.

Below is the sequence of dates and events of interactions between NMFS, USGS, and the GSC regarding the IHA and seismic survey:

- August 2, 2010—*Healy* departed Dutch Harbor, Alaska.
- August 6, 2010—*St. Laurent* underway from Kugluktuk, Nunavut, Canada.
- August 8, 2010—*Healy* commenced hydrographic survey of U.S./Canada disputed zone.
- August 9, 2010—*Healy* finished hydrographic survey of U.S./Canada disputed zone.
- August 10, 2010—*Healy* and *St. Laurent* rendezvous, transfer personnel, and proceed in convoy toward U.S. EEZ.
- August 11, 2010—*Healy* proceeds alone within U.S. EEZ for sampling program. IHA received via email and MSR received to conduct science operations in U.S. EEZ.
- August 12, 2010—*St. Laurent* begins seismic operations (line 6) in the U.S. EEZ.
- August 13, 2010—*Healy* joins the *St. Laurent* for seismic operations (line 7).

While USGS has yet to submit its draft 90 day monitoring report, NMFS is not aware of any incidences of non-compliance or violations of the MMPA.

Comment 14: The AEWG states that the authorization itself must prescribe certain requirements such as “permissible methods for taking by harassment,” “means of effecting the least practicable impact on such species,” measures to “ensure no unmitigable adverse impact on the availability of the species or stock for taking for subsistence use,” requirements pertaining to “monitoring and reporting,” and for “independent peer review” of such monitoring and reporting if the taking may affect subsistence use. Indeed, NMFS’ regulations further provide that “any preliminary finding of ‘negligible impact’ and ‘no unmitigable adverse impact’ shall be proposed for public comment along with the proposed IHA.” Without understanding exactly how the IHA incorporates these requirements through specific language, the public is foreclosed from providing input on how the activities will be regulated.

Response: The July 8, 2010, proposed IHA notice (75 FR 39336) contained all the relevant information needed by the public to provide comments on the

proposed authorization itself. The notice contained the permissible methods of taking by harassment, means of effecting the least practicable impact on such species or stocks (i.e., mitigation), information that ensures no unmitigable adverse impact on the availability of the species or stock for taking for subsistence use, and requirements pertaining to the monitoring and reporting of such taking. The notice provided detail on all of these points and, in NMFS view, allowed the public to comment on the proposed authorization and inform NMFS’ final decision. Additionally, the notice contained NMFS’ preliminary findings of small numbers, negligible impact, and no unmitigable adverse impact.

NMFS’ implementing regulations at 50 CFR 216.108(d) state that an independent peer review of a monitoring plan is required if the activity may affect the availability of a species or stock of marine mammals for taking for subsistence purposes. The independent peer review of monitoring plans for ITA applications is not required for activities that occur outside of Arctic waters or in Arctic waters if it is determined that the activity will not affect the availability of a species or stock of marine mammals for taking for subsistence purposes. The USGS provided NMFS with a draft IHA application in early March, 2010, which included information on the timing and location of its proposed seismic lines. The USGS application stated that the proposed survey will begin inside the U.S. EEZ and then move further and further offshore and eventually outside the U.S. EEZ for the majority of the survey. The lines inside U.S. waters were approximately 96.6 km (60 mi) from Barrow and will be surveyed for five days, planned for mid-August. If equipment or weather malfunctions cause some delays, the USGS had indicated to NMFS that they will be outside of the U.S. EEZ by August 25, which has been the typical shut-down date in the Beaufort Sea so that villages could begin to prepare for the fall bowhead hunt. This whaling shut-down date especially applies to activities occurring near Kaktovik and Cross Island. This survey will be occurring west of those two communities’ hunts.

Based on this information, NMFS preliminarily determined that the proposed USGS seismic survey would not affect the availability of bowhead whales for taking for subsistence purposes. Belugas are not hunted at this time of the year in this particular part of the Arctic. Additionally, while seal hunting can occur year round in the

Beaufort Sea, it most commonly occurs from October until June (outside of the time frame of the USGS’s activity). Moreover, most seal hunting does not occur this far offshore.

Therefore, since NMFS preliminarily determined (based on the information contained in the draft IHA application) that the USGS’s activity would not affect the availability of a species or stock of marine mammals for taking for subsistence purposes, NMFS determined that their activity did not trigger the requirement for independent peer review of the monitoring plan. The trigger for needing an independent peer review of the monitoring plan is slightly different than the “no unmitigable adverse impact” determination that NMFS must make prior to the issuance of an IHA. If the AEWG or other interested parties wish to have the opportunity to make comments on the monitoring proposed by the USGS for its seismic survey, comments may be provided to NMFS for consideration during the 30-day public comment period for the proposed IHA announced in the **Federal Register** notice.

Comment 15: The Conflict Avoidance Agreement (CAA) contains protective measures that should have been applied to USGS’s operations to ensure effective communication between the ships and AEWG whaling captains and to ensure that those ships adhere to travel routes through the Chukchi that AEWG whaling captains have designated. The AEWG is particularly concerned because the **Federal Register** notice and the IHA application make clear that the USGS intends to transit the *Healy* through the Bering Strait, across the Chukchi Sea, and into the survey area in the Beaufort Sea during the first week of August, 2010. The NSB and AEWG states that vessel transit across the Chukchi, a major issue of concern for their whaling community and a focus of the Open Water Season CAA, was to begin even earlier. The NSB and AEWG also reiterates that NMFS should be imposing the mitigation measures developed in the CAA to ensure that regulated activities do not have an unmitigable adverse impact on subsistence activities. In this case, the USGS plans to transit the Chukchi Sea in early August and the CAA speaks directly to this issue, with those provisions having been developed by whaling captains and offshore operators over several seasons. Neither USGS nor NMFS discusses in the IHA application or the **Federal Register** notice the potential impacts resulting from vessel transit or the protective measures developed by the AEWG, which have been approved by the local whaling

captains. The AEWC asks for clarification from NMFS as to whether it views the USGS's vessel transit as an activity that potentially results in take of marine mammals or adverse impacts to subsistence activities. The AEWC is concerned that NMFS failed to consider at all the potential impacts of vessel traffic to and from the survey area. A simple and straightforward manner to address these issues would be to adopt the provisions of the CAA or simply require the USGS the CAA as a basis for making the statutorily required findings of no unmitigable adverse impacts to subsistence activities. The AEWC states that it is extremely unfortunate that the AEWC are only being given an opportunity to comment on these activities as they are already occurring or have already occurred.

Response: USGS, in the comments matrix of the EA, responded to the overall concern about complying with the CAA as follows "the CAA is intended primarily for oil and gas activities in the nearshore (see scope statement, p. 4 of CAA, industry funding of communication centers p. 14 of CAA, etc.)." To the extent the proposed activity of this EA is to conduct work greater than 100 km (62.1 mi) offshore, primarily for scientific research, the CAA is not directly applicable.

However, USGS is following the spirit of the CAA through their Plan of Cooperation. Through discussions with the NSB and AEWC about conducting the seismic lines within the U.S. EEZ, i.e., the lines closest to the locations of the potential migration pathway of the bowhead whale and subsistence hunting activities, USGS has agreed to conduct these tracks at the beginning of the survey (early to mid August) when it should pose no interference or potential to interfere with the Nuiqsut, Kaktovik, or Barrow whaling seasons.

Part of the Plan of Cooperation is for the *Healy* to also carry as part of the science party an Alaska Native community observer to ensure that communications with the subsistence community are maintained. Both the *Healy* and *St. Laurent* will have PSOs as part of the proposed strategy for monitoring and mitigation.

With regards to the concern about the *Healy* in the Chukchi Sea, the *Healy* was on transit through the Chukchi Sea to begin work in the Beaufort Sea. The CAA requests that transiting vessels "should remain as far offshore as weather and ice conditions allow and at all times at least 8 km (5 mi) during transit." During transit, the *Healy* remained more than 48.3 km (30 mi) offshore during its transit through the

Chukchi Sea. USGS also has hired a member of the Alaska Native community as an observer and communicator aboard the *Healy*. Therefore, although USGS has not specifically mentioned the CAA in the EA (and the CAA, which focuses on industry activities, is not directly relevant to the proposed USGS activity), USGS is following the spirit of the agreement. Location of the *Healy's* transit track through the Chukchi Sea, as monitored by the sailwx.info organization can be found online at: <http://www.sailwx.info/shiptrack/shipposition.phtml?call=NEPP>.

The signing of a CAA is not a requirement to obtain an IHA. The CAA is a document that is negotiated between and signed by the industry participant, AEWC, and the Village Whaling Captains' Associations. NMFS has no role in the development or execution of this agreement. Although the contents of a CAA may inform NMFS' no unmitigable adverse impact determination for bowhead and beluga whales and ice seals, the signing of it is not a requirement. Despite the lack of a signed CAA for USGS activities, NMFS is confident that USGS's survey and the measures contained in the IHA will ensure no unmitigable adverse impact to subsistence users.

Comment 16: The NSB and AEWC reiterates earlier comments they have made with respect to previous IHA applications and proposed IHAs for this open water season, namely that OPR lacks an adequate scientific and legal basis for issuing the proposed IHAs. As an example, OPR continues to operate under flawed monitoring and mitigation measures that fail to provide adequate protections against takes for Level A harassment and do not adhere to the best available science. And, OPR similarly fails entirely to consider the impacts of this project in the context of all other oil and gas activities planned for the Arctic Ocean. As opposed to restating those comments, the NSB and AEWC incorporates them by reference and asks that NMFS give serious consideration to the concerns set forth in those earlier documents.

Response: NMFS has addressed the NSB's and AEWC's comments submitted regarding earlier proposed IHAs for this open water season, see NMFS' responses in the Notice of Issuance of IHAs for Shell Offshore, Inc. (75 FR 49710) and Statoil USA E&P (75 FR 49760), published in the **Federal Register**. NMFS believes that USGS' monitoring and mitigation measures are adequate (see Mitigation and Monitoring and Reporting sections below), and NMFS has determined that USGS'

activities will not result in Level A harassment (injury) or mortality of marine mammals, and no injury or mortality is authorized under the IHA.

A number of public comments about the accuracy of data were raised in the EA and are addressed in the comment matrix (p. 228 to 232). USGS's final EA and Finding of No Significant Impact can be found online at: <http://pubs.usgs.gov/of/2010/1117/>. Included in the comment matrix are a response to questions about associations between seismic activity and to Level A harassment, strandings and mortality. USGS agrees that more data are required, but "nearly all cases have shown clear evidence of harm or cause of death by something other than underwater sounds." The EA also expanded the section on cumulative impacts to address similar concerns raised in comments on the draft EA.

Comment 17: The AEWC reiterates how this proposed project demonstrates the flawed nature of NMFS' mitigation measures as they relate to EZs. As plain logic and the best available science tell us, EZs are only as effective as the people who monitor those areas for marine mammals. NMFS has stated that the PSO will not be on duty during nighttime operations and yet seismic operations will be allowed to continue 24 hours per day (75 FR 39369). USGS survey crews will encounter as much as 8.5 hours of darkness per day during the survey operations. During those times, NMFS states that bridge personnel will keep watch for marine mammals "insofar as practical." This requirement is meaningless, as anyone who has spent time on the water will tell you that no bridge personnel can identify marine mammals at night in Arctic conditions. It is absolutely unacceptable for NMFS to simply look the other way while vessels shoot seismic in the Arctic without any monitoring at all to prevent take by Level A harassment. Given the fact that the proposed operations will emit sounds well in excess of 190 dB (rms), and the fact that USGS will be operating without any observers for much of the time, AEWC fails to see how NMFS could possibly rule out the potential for take by Level A harassment. This determination simply has no basis in science or law.

Response: It will be continuous daylight during most of the survey, which will accommodate 24 hour/day monitoring by PSOs during most of the survey. The IHA, which authorizes Level B harassment, is only valid for the *St. Laurent* and *Healy's* activities associated with seismic survey operations within the EEZ of the U.S. and the *Healy's* icebreaking operations

in international waters. The GSC has written a Categorical Declaration stating that “while in U.S. waters, the GSC operators will comply with any and all environmental mitigation measures required by NMFS.” The two icebreakers work cooperatively in U.S. waters for only a small portion (approximately 5 days) of the seismic survey. NMFS has determined that USGS’ activities will not result in injury or mortality of marine mammals, and no injury or mortality is authorized under the IHA.

Comment 18: Because the AEWG is responsible for protecting their bowhead subsistence hunt, that is the cornerstone of their subsistence livelihood and way of life, they take very seriously the changes and impacts the AEWG are seeing in their waters and the need for vigilant Federal regulatory oversight of potential impacts. The AEWG hope that NMFS and NOAA will take seriously the lessons being learned at the Department of the Interior regarding the costs of lax regulatory oversight, in the wake of the Deep Water Horizon disaster. Similarly, the AEWG hopes that these agencies will take seriously the legal risk their communities face in the context of an increasingly irrational process at the International Whaling Commission.

Response: USGS and NMFS conducted a thorough analysis of the potential impacts of this proposed activity (with a focus on sound from geophysical surveys and icebreaking) on marine mammals; a cumulative impact analysis was also done under NEPA. Multiple studies and research have been cited that support NMFS’ MMPA and NEPA determinations that the localized and short-term disturbance from seismic surveys, with strict mitigation and monitoring measures implemented, is likely to result in negligible impacts to marine mammals and no significant impact to the human environment, respectively. NMFS does not have any direct role in issuing permits for offshore drilling other than evaluating impacts of leasing and other activities under the MMPA and ESA. NOAA has been in communication with the BOEMRE regarding activities on the outer continental shelf.

Comment 19: The AEWG states that they are forced to write comments to NMFS expressing their concerns about impacts to their marine mammal species from operations that are supposedly regulated by NMFS that are already occurring out in the water. Rather than consult with the directly affected communities, as it has agreed to do, NMFS ignores the AEWG, allowing applicants to commence operations before reviewing their public comments

submitted as part of the general public process, before responding to their comments, or even before the IHA has been issued. AEWG states that this is no more than a simple exercise in paper shuffling without any substantive and meaningful opportunity for input from the local community.

Response: NMFS does not authorize operations in Arctic waters; NMFS authorizes the take of marine mammals incidental to an otherwise legal specific activity in a specified geographic area. NMFS disagrees with the AEWG’s statement regarding ignoring the review of their public comments submitted as part of the general public process. The AEWG submitted comments on the USGS IHA application and proposed IHA to NMFS OPR via email after the close of business on August 11, 2010 and were reviewed by NMFS OPR on August 12, 2010. The public comment period for the USGS proposed IHA closed on August 9, 2010, and the IHA was issued to USGS on August 11, 2010, after reviewing and responding to substantive comments from the Commission and NSB. See other NMFS responses to comments in this notice regarding opportunities for substantive and meaningful input from the local community.

Comment 20: AEWG states that NMFS is in plain violation of the MMPA by failing to provide to the public a “proposed IHA.” Instead of providing a draft of the authorization itself, NMFS publishes a **Federal Register** notice that describes the application and the basis for the agency’s proposed statutory findings. Because the IHA is the specific authorization that governs the harassing activities, it is imperative that the AEWG be allowed input into the actual draft authorization and not simply be given a description of the mitigation measures and proposed findings. In a functional governmental system, NMFS would publish a draft authorization and take public comment on that document well in advance so that AEWG whaling captains could provide meaningful input. In the alternative and in the event of a timing issue, NMFS would consult directly with AEWG under the NMFS/NOAA–AEWG Cooperative Agreement. Because the ships have already been deployed, it would be impossible for NMFS to consult with us or review the AEWG comments and, for instance, require USGS to implement more rigorous monitoring protocols. That is now impossible or impractical because the ships have already left port. This is but one example of NMFS disregard of its regulatory responsibilities and its utter lack of concern for the local impacts it is charged with preventing.

Response: The July 8, 2010, proposed IHA notice (75 FR 39336) contained all the relevant information needed by the public to provide comments on the proposed authorization itself. The notice contained the permissible methods of taking by harassment, means of effecting the least practicable impact on such species or stocks (*i.e.*, mitigation), information that ensures no unmitigable adverse impact on the availability of the species or stock for taking for subsistence use, and requirements pertaining to the monitoring and reporting of such taking. The notice provided detail on all of these points and, in NMFS view, allowed the public to comment on the proposed authorization and inform NMFS’ final decision.

Also, for many years, NMFS has conducted the Arctic Open Water Meeting, which brings together the Federal agencies, the oil and gas industry, and affected Alaska Native organizations to discuss the proposed activities and monitoring plans. Local knowledge is considered at these times, and it is not too late for that knowledge to serve a useful purpose. These communities are also afforded the opportunity to submit comments on the application and proposed IHA notice, which are then considered by NMFS before making a final determination on whether or not to issue an IHA.

NOAA and the AEWG co-manage bowhead whales pursuant to a cooperative agreement. This agreement has allowed the AEWG to play a significant role in the management of a valuable resource by affording Alaska Natives the opportunity to protect bowhead whales and the Eskimo culture and to promote scientific investigation, among other purposes. NMFS works closely with Alaska Natives when considering whether to permit the take of marine mammals incidental to operations in the Arctic. NMFS has met repeatedly over the years with Alaska Native representatives to discuss concerns related to NMFS’ MMPA program in the Arctic, and has also taken into account recommended monitoring and mitigation measures to reduce the impact of operations on marine mammals and to ensure the availability of marine mammals for taking for subsistence uses. NMFS has participated in Alaska Native community meetings in the past and will continue to do so.

Comment 21: The AEWG states that NMFS has a long track record of publishing its response to AEWG public comments many weeks and months after the IHA has been issued and after the activities have commenced (and in

many times concluded). This issue again convinces us that the AEWG comments are not given serious consideration by the agency before its decision has been made. If the agency cannot articulate a rationale response to public comments, it should not grant the requested authorization. Moreover, if activities are going to commence in AEWG waters, potentially interfering with subsistence activities or the migration of the AEWG's marine mammals, the government owes us a reasoned response to their concerns before allowing the activities to proceed. Again, as the AEWG writes their comments, they know that the boats are already in the water, the activities will begin in a matter of days, and NMFS will not bother to respond to the AEWG's concerns until well after the harmful activities have taken place. This is little more than an exercise in paper shuffling with the agency already having made up its mind or simply turning a blind eye to activities that will occur without coverage from a valid IHA.

The AEWG states that NMFS' public process is fundamentally broken and must be reformulated. NMFS should not allow USGS to commence operations until the AEWG has had the statutorily required opportunity to comment on the draft authorization and NMFS has published responses to those comments. Time and again, NMFS has requested input from the AEWG and other stakeholders into how the agency can better respond to the AEWG's concerns. At bare minimum, the AEWG asks that NMFS reformulate its public participation process to provide meaningful opportunities for the local community. As it stands now, the agency has given every indication that it does not give serious consideration to the AEWG's concerns.

Response: NMFS does not agree with AEWG's statement that NMFS' failure to release its response to comments until after an IHA has been issued or activities have commenced casts doubt on the validity of NMFS' public involvement process, or the underlying analysis of impacts to subsistence activities and marine mammals. All substantive public comments received during the 30 day comment period on proposed IHAs are seriously considered before NMFS' decides whether to issue IHAs. The decision to issue an IHA to USGS for its proposed marine surveys in the Arctic Ocean is based in large part on NMFS' definitions of "negligible impact" and "unmitigable adverse impact," the proposed mitigation and monitoring measures, the scope of activities proposed to be conducted,

including time of year, location, and presence of marine mammals in the project area, extensive research and studies on potential impacts of anthropogenic sounds to marine mammals, marine mammal behavior, distribution, and movements in the vicinity of USGS's proposed project area, USGS's Plan of Cooperation, and on public comments received during the commenting period. The reason that NMFS was not able to publish its response to comments on proposed IHA activities for USGS's until the end of the survey activities was largely due to travel and workload issues. NMFS will continue to ensure that all public comments are considered in full and strive to publish responses at the time IHAs or LOAs are issued.

Description of Marine Mammals in the Activity Area

Regarding marine mammals, a total of nine cetacean species, including four odontocete species (dolphins, porpoises, and small- and large-toothed whales), five mysticete species (baleen whales), and five pinniped species (seals, sea lions, and walrus) and the polar bear are known to occur in the area affected by the specified activities associated with the proposed Arctic Ocean marine seismic survey (see Table 3 of USGS's application). Cetaceans and pinnipeds, which are the subject of this IHA application, are protected by the MMPA and managed by NMFS in accordance with its requirements. In the U.S., the walrus and polar bear are managed under the jurisdiction of the USFWS and are not considered further in this analysis. Information on the occurrence, distribution, population size, and conservation status for each of the 14 marine mammal species that may occur in the proposed project area is presented in the Table 4 of USGS's application as well as here in the table below (Table 4). Several marine mammal species that may be affected by the proposed IHA are listed as Endangered or Threatened under Section 4 of the ESA, including the bowhead, fin and humpback whale, and polar bear. The bowhead whale is common in the Arctic, but unlikely in the survey area. Based on a small number of sightings in the Chukchi Sea, the fin whale is unlikely to be encountered along the planned trackline in the Arctic Ocean. Humpback whales are uncommon in the Chukchi Sea and normally do not occur in the Beaufort Sea. Several humpback sightings were recorded during vessel-based surveys in the Chukchi Sea in 2007 (three sightings) and 2008 (one sighting; Haley *et al.*, 2009). The only known occurrence of humpback whale in the

Beaufort Sea was a single sighting of a cow and calf reported and photographed in 2007 (Green *et al.*, 2007). Based on the low number of sightings in the Chukchi and Beaufort seas, humpback whales would be unlikely to occur in the vicinity of the proposed geophysical activities.

The marine mammal species under NMFS jurisdiction most likely to occur in the seismic survey area include two cetacean species (beluga and bowhead whales), and two pinniped species (ringed and bearded seals). These species however, will likely occur in low numbers and most sightings will likely occur in locations within 100 km (62 mi) of shore where no seismic work is planned. The marine mammal most likely to be encountered throughout the cruise is the ringed seal.

Five additional cetacean species—narwhal, killer whale, harbor porpoise, gray whale, and minke whale—could occur in the project area. Gray whales occur regularly in continental shelf waters along the Chukchi Sea coast in summer and to a lesser extent along the Beaufort Sea coast. Recent evidence from monitoring activities in the Chukchi and Beaufort seas during industry seismic surveys suggests that harbor porpoise and minke whales, which have been considered uncommon or rare in the Chukchi and Beaufort seas, may be increasing in numbers in these areas (Funk *et al.*, 2009). Small numbers of killer whales have also been recorded during these industry surveys, along with a few sightings of fin and humpback whales. The narwhal occurs in Canadian waters and occasionally in the Beaufort Sea, but is rare there and not expected to be encountered. Each of these species is uncommon or rare in the Chukchi and Beaufort seas, and relatively few if any encounters with these species are expected during the seismic program.

Additional pinniped species that could be encountered during the proposed seismic survey include spotted and ribbon seals, and Pacific walrus. Spotted seals are more abundant in the Chukchi Sea and occur in small numbers in the Beaufort Sea. The ribbon seal is uncommon in the Chukchi Sea and there are few sightings in the Beaufort Sea. The Pacific walrus is common in the Chukchi Sea, but uncommon in the Beaufort Sea and not likely to occur in the deep waters of the proposed survey area. None of these species would likely be encountered during the proposed cruise other than perhaps transit periods to and from the survey area.

Table 4 below outlines the marine mammal species, their habitat and

abundance in the proposed project area, their conservation status, and density. Additional information regarding the distribution of these species expected to

be found in the project area and how the estimated densities were calculated may be found in USGS's IHA application and was included in the notice of the

proposed IHA (75 FR 39336, July 8, 2010).

TABLE 4—THE HABITAT, REGIONAL ABUNDANCE, CONSERVATION STATUS, AND BEST AND MAXIMUM DENSITY ESTIMATES OF MARINE MAMMALS THAT COULD OCCUR IN OR NEAR THE SEISMIC SURVEY AREA IN THE ARCTIC OCEAN. See TABLE 4 AND 5 IN USGS'S APPLICATION FOR FURTHER DETAIL

Species	Habitat	Abundance/regional population size	ESA ^a	MMPA ^o	Best ^b density (#/km ²) open water, ice margin, polar pack	Max ^c density (#/km ²) open water, ice margin, polar pack
Odontocetes:						
Beluga whale (<i>Delphinapterus leucas</i>).	Offshore, coastal, ice edges.	3,710 ^d 39,257 ^e	NL	NC D—Cook Inlet	0.0354 0.0354 0.0035	0.0709 0.0709 0.0071
Narwhal (<i>Monodon monocerus</i>).	Offshore, ice edge	Rare ^f	NL	N.A.	0.0000 0.0000 0.0000	0.0001 0.0002 0.0001
Killer whale (<i>Orcinus orca</i>).	Widely distributed	Rare	NL	NC D—AT1 Transient Population, Southern Resident Population.	0.0000 0.0000 0.0000	0.0001 0.0001 0.0001
Harbor porpoise (<i>Phocoena phocoena</i>).	Coastal, inland waters, shallow offshore waters.	Common (Chukchi) Uncommon (Beaufort)	NL	NC	0.0000 0.0000 0.0001	0.0001 0.0001 0.0001
Mysticetes:						
Bowhead whale (<i>Balaena mysticetus</i>).	Pack ice and coastal ..	10,545 ^g	EN	D	N.A.	N.A.
Eastern Pacific gray whale (<i>Eschrichtius robustus</i>).	Coastal, lagoons	488 ^h 17,500 ⁱ	NL	NC D—Western North Pacific Population.	0.0000 0.0000 0.0000	0.0001 0.0001 0.0001
Minke whale (<i>Balaenoptera acutorostrata</i>).	Shelf, coastal	Small numbers	NL	NC	0.0000 0.0000 0.0000	0.0001 0.0001 0.0001
Fin whale (<i>Balaenoptera physalus</i>).	Slope, mostly pelagic	Rare (Chukchi)	E	D	0.0000 0.0000 0.0000	0.0001 0.0001 0.0001
Humpback whale (<i>Megaptera novaeangliae</i>).	Shelf, coastal	Rare	EN	D	0.0000 0.0000 0.0000	0.0001 0.0001 0.0001
Pinnipeds:						
Bearded seal (<i>Erignathus barbatus</i>).	Pack ice, open water	300,000—450,000 ^j	C	NC	0.0096 0.0128 0.0013	0.0384 0.0512 0.0051
Spotted seal (<i>Phoca largha</i>).	Pack ice, open water, coastal haul-outs.	59,214 ^k	P—T	NC	0.0001 0.0001 0.0000	0.0004 0.0004 0.0000
Ringed seal (<i>Phoca hispida</i>).	Landfast and pack ice, open water.	18,000 ^l 208,000—252,000 ^m	C	NC	0.1883 0.2510 0.0251	0.7530 1.0040 0.1004
Ribbon seal (<i>Histiophoca fasciata</i>).	Pack ice, open water	90,000—100,000 ⁿ	NL	NC	N.A.	N.A.
Pacific walrus (<i>Odobenus rosmarus divergens</i>).	Ice, coastal	N.A.	NL	S—Pacific	N.A.	N.A.
Carnivores: Polar bear (<i>Ursus maritimus marinus</i>)	Ice, coastal	N.A.	T	S—Chukchi/Bearing Sea.	N.A.	N.A.

N.A.—Data not available or species status was not assessed.

^a U.S. Endangered Species Act: EN = Endangered, T = Threatened, C = Candidate, P = Proposed, NL = Not listed.

^b Best estimate as listed in Table 5 and Add-3 of the application.

^c Maximum estimate as listed in Table 5 and Add-3 of the application.

^d Eastern Chukchi Sea stock based on 1989 to 1991 surveys with a correction factor (Angliss and Allen, 2009)

^e Beaufort Sea stock based on surveys in 1992 (Angliss and Allen, 2009)

^f DFO (2004) states the population in Baffin Bay and the Canadian Arctic archipelago is approximately 60,000; very few of these enter the Beaufort Sea.

^g Abundance of bowhead whales surveyed near Barrow, as of 2001 (George *et al.*, 2004). Revised to 10,545 by Zeh and Punt (2005).

^h Southern Chukchi Sea and northern Bering Sea (Clarks and Moore, 2002)

¹ Eastern North Pacific gray whale population (Rugh *et al.*, 2008)

² Based on earlier estimates, no current population estimate available (Angliss and Allen, 2009)

³ Alaska stock based on aerial surveys in 1992 (Angliss and Allen, 2009)

⁴ Beaufort Sea minimum estimate with no correction factor based on aerial surveys in 1996 to 1999 (Frost *et al.*, 2002 in Angliss and Allen, 2009)

⁵ Eastern Chukchi Sea population (Bengston *et al.*, 2005)

⁶ Bering Sea population (Burns, 1981a in Angliss and Allen, 2009)

⁷ U.S. Marine Mammal Protection Act: NC = Not Classified, D = Depleted, S = Strategic.

Within the latitudes of the proposed survey when the *Healy* will be breaking ice outside of U.S. waters, no cetaceans were observed by PSOs along approximately 21,322 km (13,248.9 mi) of effort during projects in 2005, 2006, 2008, and 2009 (Haley and Ireland, 2006; Haley, 2006; Jackson and

DesRoches, 2008; Mosher *et al.*, 2009). The estimated maximum amount of icebreaking outside of U.S. waters for this project, i.e., 3,372 line km (2,095.3 mi), is considerably less than the combined trackline for the aforementioned projects. At least one PSO will stand watch at all times while

the *Healy* is breaking ice for the *St. Laurent*. USGS does not expect that PSOs will observe any cetaceans during the proposed survey. Seals were reported by PSOs during the 2005, 2006, 2008, and 2009 effort within the latitudes of the proposed survey.

TABLE 5—NUMBER OF PINNIPEDS REPORTED DURING 2005, 2006, 2008, AND 2009 PROJECTS WITHIN THE LATITUDES WHERE THE *Healy* WILL BE BREAKING ICE OUTSIDE OF U.S. WATERS FOR THE PROPOSED ARCTIC OCEAN SURVEY (HALEY AND IRELAND, 2006; HALEY, 2006, GSC UNPUBLISHED DATA, 2008; MOSHER ET AL., 2009)

Pinniped species	Number of sightings	Number of individuals
Ringed seal	116	125
Bearded seal	24	26
Unidentified seal	128	140
Totals	268	291

Potential Effects on Marine Mammals

Potential Effects of Airgun Sounds

The effects of sounds from airguns might result in one or more of the following: tolerance, masking of natural sounds, behavioral disturbances, temporary or permanent hearing impairment, or non-auditory physical or physiological effects (Richardson *et al.*, 1995; Gordon *et al.*, 2004; Nowacek *et al.*, 2007; Southall *et al.*, 2007). Permanent hearing impairment, in the unlikely event that it occurred, would constitute injury, but temporary threshold shift (TTS) is not an injury (Southall *et al.*, 2007). Although the possibility cannot be entirely excluded, it is unlikely that the project would result in any cases of temporary or especially permanent hearing impairment, or any significant non-auditory physical or physiological effects. Some behavioral disturbance is expected, but this would be localized and short-term.

The notice of the proposed IHA (75 FR 39336, July 8, 2010) included a discussion of the effects of sound from airguns on mysticetes, odontocetes, and pinnipeds, including tolerance, masking, behavioral disturbance, hearing impairment, and other non-auditory physical effects. Additional information on the behavioral reactions (or lack thereof) by all types of marine mammals to seismic vessels can be

found in USGS's application and associated EA.

The notice of the proposed IHA also included a discussion of the potential effects of the multi-beam echosounders (MBES), sub-bottom profilers (SBP), acoustic Doppler current profilers (ADCP), and icebreaking activities. Because of the shape of the beams of these sources (i.e., MBES, SBP, and ADCP), NMFS believes it unlikely that marine mammals will be exposed to sound levels at or above those likely to cause Level B harassment.

Estimated Take of Marine Mammals by Incidental Harassment

The notice of the proposed IHA (75 FR 39336, July 8, 2010) included an in-depth discussion of the methods used to calculate the densities of the marine mammals in the area of the seismic survey and the take estimates. Additional information was included in USGS's application. A summary is included here.

All anticipated takes would be "takes by Level B harassment," involving temporary changes in behavior. The proposed monitoring and mitigation measures are expected to minimize the possibility of injurious takes or mortality. However, as noted earlier, there is no specific information demonstrating that injurious "takes" or mortality would occur even in the absence of the planned monitoring and mitigation measures. NMFS believes,

therefore, that injurious take or mortality to the affected species marine mammals is extremely unlikely to occur as a result of the specified activities within the specified geographic area for which USGS seeks the IHA. The sections below describe methods to estimate "take by harassment," and present estimates of the numbers of marine mammals that could be affected during the seismic study in the Arctic Ocean. The estimates of "take by harassment" are based on data obtained during marine mammal surveys in and near the Arctic Ocean by Stirling *et al.* (1982), Kingsley (1986), Moore *et al.* (2000b), Haley and Ireland (2006), Haley (2006), GSC unpublished data (2008), and Mosher *et al.* (2009), Bowhead Whale Aerial Survey Program (BWASP), and on estimates of the sizes of the areas where effects could potentially occur. In some cases these estimates were made from data collected from regions and habitats that differed from the proposed project area.

Detectability bias, quantified in part by $f(0)$, is associated with diminishing sightability with increasing lateral distance from the trackline. Availability bias ($g(0)$) refers to the fact that there is less than 100 percent probability of sighting an animal that is present along the survey trackline. Some sources of densities used below included these correction factors in their reported densities. In other cases the best densities used below included these

correction factors in their reported densities. In other cases the best available correction factors were applied to reported results when they had not been included in the reported data (Moore *et al.*, 2000b). Adjustments to reported population or density estimates were made on a case by case basis to take into account differences between the source data and the general information on the distribution and abundance of the species in the proposed project area.

Although several systematic surveys of marine mammals have been conducted in the southern Beaufort Sea, few data (systematic or otherwise) are available on the distribution and numbers of marine mammals in the northern Beaufort Sea or offshore water of the Arctic Ocean. The main sources of distributional and numerical data used in deriving the estimates are described in the next subsection. Both “maximum estimates” as well as “best estimates” of marine mammal densities (see Table 5 of the IHA application) and the numbers of marine mammals potentially exposed to underwater sound (see Table 6 of the IHA application) were calculated as described below. The best (or average) estimate is based on available distribution and abundance data and represents the most likely number of animals that may be encountered during the survey, assuming no avoidance of the airguns or vessel. The maximum estimate is either the highest estimate from applicable distribution and abundance data or the average estimate increased by a multiplier intended to produce a very conservative (over) estimate of the number of animals that may be present in the survey area. There is some uncertainty about how representative the available data are and the assumptions used below to estimate the potential “take by harassment.” However, the approach used here is accepted by NMFS as the best available at this time.

USGS has calculated exposures to marine mammals within U.S. waters only. After the *St. Laurent* (a Canadian icebreaker) exits U.S. waters, their activities no longer fall under the jurisdiction of the U.S. or the MMPA.

The following estimates are based on a consideration of the number of marine mammals that might be disturbed appreciably over the approximately 806 line km (501 mi) of seismic surveys within U.S. waters across the Arctic Ocean. An assumed total of 1,007.5 km (626 mi) of trackline includes a 25 percent allowance over and above the planned approximately 806 km to allow for turns, lines that might have to be

repeated because of poor data quality, or for minor changes to the survey design.

The anticipated radii of influence of the lower energy sound sources including Chirp echosounder (on the *St. Laurent*) and bathymetric echosounder (on the *Healy*) are less than that for the airgun configuration. It is assumed that during simultaneous operation of the airgun array and echosounder, any marine mammals close enough to be affected by the MBES, SBP, and ADCP would already be affected by the airguns. However, whether or not the airguns are operating simultaneously with the other sound sources, marine mammals are expected to exhibit no more than short-term and inconsequential responses to the MBES, SBP, and ADCP sounder given its characteristics (e.g., narrow downward-directed beam) and other considerations described in the IHA application. Similar responses are expected from marine mammals exposed to the *Healy*’s bathymetric profiler. Such reactions are not considered to constitute “taking” as defined by NMFS (NMFS, 2001). Therefore, no additional allowance is included for animals that might be exposed to sound sources other than the airguns and icebreaking.

Marine Mammal Density Estimates

Numbers of marine mammals that might be present and potentially disturbed are estimated based on available data about marine mammal distribution and densities in the Arctic Ocean study area during the summer. “Take by harassment” is calculated by multiplying expected densities of marine mammals likely to occur in the survey area by the area of water potentially ensonified to sound levels ≥ 160 dB re 1 μ Pa (rms) for the airgun operations and ≥ 120 dB re 1 μ Pa (rms) for icebreaking activities. Estimates for icebreaking are based on a consideration of the number of marine mammals that might be disturbed appreciably over the approximately 3,102 to 3,372 line km (1,927.5 to 2,095.3 mi) of icebreaking that may occur during the proposed project. This section provides descriptions of the estimated densities of marine mammals that may occur in the proposed survey area. The area of water that may be ensonified to the indicated sound level is described further below. There is no evidence that avoidance at received sound levels ≥ 160 dB would have significant effects on individual animals or that the subtle changes in behavior or movements would rise to the level of taking according to guidance by NMFS (NMFS, 2001).

Some surveys of marine mammals have been conducted near the southern end of the proposed project area, but few data are available on the species and abundance of marine mammals in the northern Beaufort Sea and the Arctic Ocean. No published densities of marine mammals are available for the region of the proposed survey (including between 74° and 84° North where the *Healy* will be breaking ice outside U.S. waters), although vessel-based surveys through the general area in 2005, 2006, 2008, and 2009 encountered few marine mammals. A total of two polar bears, 36 seals, and a single beluga whale sighting(s) were recorded along approximately 2,299 km (1,429 mi) of monitored trackline between 71° North and 74° North (Haley and Ireland, 2006; Haley, 2006; GSC unpublished data, 2008; Mosher *et al.*, 2009). PSOs recorded 268 sightings of 291 individual seals along approximately 21,322 km (13,248.9 mi) of monitored trackline between 74° and 84° North (Haley and Ireland, 2006; Haley, 2006; GSC unpublished data, 2008; Mosher *et al.*, 2009). No cetaceans were observed during the surveys between 74° and 84° North. Given the few sightings of marine mammals along the 21,322 km (13,248.9 mi) vessel trackline in previous years, USGS estimate that the densities of marine mammals encountered while breaking ice will be 1/10 of the estimated densities of marine mammals encountered within the ice margin habitat described in the original application.

Given that the survey lines within U.S. waters extend from latitudes 71° to 74° North, it is likely that seismic operations will be conducted in both open-water and sea-ice conditions. Because densities of marine mammals often differ between open-water and pack-ice areas, the likely extent of the pack-ice at the time of the survey was estimated. Images of average monthly sea ice concentration for August from 2005 through 2009, available from the National Snow and Ice Data Center (NSIDC), were used to identify 74° North latitude as a reasonable ice-edge boundary applicable to the proposed study period and location. Based on these satellite data, the majority of the survey in U.S. waters will be conducted in open water and unconsolidated pack ice, in the southern latitudes of the survey area. This region will include the ice margin where the highest densities of cetaceans and pinnipeds are likely to be encountered. The proposed survey lines within U.S. waters reach approximately 74.10° North, extending

within the estimated ice-edge boundary for August, 2010 by approximately 19 km (10 nmi). This comprises less than 3 percent of the total trackline within U.S. waters. USGS has divided the survey effort between the two habitat zones of open water and ice margin based on the 2005 to 2009 NSIDC satellite data described above and the planned location of the tracklines. NSIDC data from 2005 to 2009 suggests little ice will be present south of 74° North, although data from the 2009 cruise (Mosher *et al.*, 2009) shows that inter-annual variability could result in a greater amount of ice being encountered than expected. As a conservative measure, USGS estimated that, within U.S. waters, 80 percent of the survey tracklines will occur in open water and 20 percent of the tracklines will occur within the ice margin.

The NSIDC (2009) reported that more Arctic sea ice cover in 2009 remained after the summer than in the record-setting low years of 2007 and 2008. USGS expects that sea ice density and extent in 2010 will be closer to the density and extent of sea ice in 2009 rather than the record-setting low years of 2007 and 2008. All animals observed during the 2009 survey (Mosher *et al.*, 2009) were north of the proposed seismic survey area, *i.e.*, north of 74° North.

Cetaceans—Average and maximum densities for each cetacean species or species group reported to occur in U.S. waters of the Arctic Ocean, within the study area, are presented in Table 5 of the IHA application. Densities were calculated based on the sightings and effort data from available survey reports. No cetaceans were observed during surveys near the proposed study area in August/September, 2005 (Haley and Ireland, 2006), August, 2006 (Haley, 2006), August/September, 2008 (GSC unpublished data, 2008) or August/September, 2009 (Mosher *et al.*, 2009).

Seasonal (summer and fall) differences in cetacean densities along the north coast of Alaska have been documented by Moore *et al.* (2000b). The proposed survey will be conducted in U.S. waters from approximately August 6 to 12, 2010, and is considered to occur during the summer season.

The summer beluga density (*see* Table 5 of the IHA application) was based on 41 sightings along 9,022 km (5,606 mi) of on-transect effort that occurred over water greater than 2,000 m (6,561.7 ft) during the summer in the Beaufort Sea (Moore *et al.*, 2000b; *see* Table 2 of the IHA application). A mean group size of 2.8 derived from BWASP data of August beluga sightings in the Beaufort Sea in water depths greater than 2,000 m was

used in the density calculation. A $f(0)$ value of 2.326 from Innes *et al.* (1996) and a $g(0)$ value of 0.419 from Innes *et al.* (1996) and Harwood *et al.* (1996) were also used in the density computation. The CV associated with group size was used to select an inflation factor of 2 to estimate the maximum density that may occur in the proposed study area within U.S. waters. Most Moore *et al.* (2000b) sightings were south of the proposed seismic survey. However, Moore *et al.* (2000b) found that beluga whales were associated with both light (1 to 10 percent) and heavy (70 to 100 percent) ice cover. Five of 23 beluga whales that Suydam *et al.* (2005) tagged in Kaseglauk Lagoon (northeast Chukchi Sea) traveled to 79 to 80° North into the pack ice and within the region of the proposed survey. These and other tagged whales moved into areas as far as 1,100 km (594 nmi) offshore between Barrow and the Mackenzie River delta, spending time in water with 90 percent ice coverage. Therefore, we applied the observed density calculated from the Moore *et al.* (2000b) sightings as the average density for both “open water” and “ice margin” habitats. Because no beluga whales were sighted during surveys in the proposed survey area (Harwood *et al.*, 2005; Haley and Ireland, 2006; Haley, 2006; GSC unpublished data, 2008; and Mosher *et al.*, 2009) the densities in Table 5 of the IHA application are probably higher than densities likely to be encountered.

By the time the survey begins in early August, most bowhead whales have typically traveled east of the proposed project area to summer in the eastern Beaufort Sea and Amundsen Gulf. Industry aerial surveys of the continental shelf near Camden Bay in 2008 recorded eastward migrating bowhead whales until July 12 (Lyons and Christie, 2009). No bowhead sightings were recorded again despite continued flights until August 19, 2010. A summer bowhead whale density was derived from 9,022 km (5,606 mi) of summer (July/August) aerial survey effort reported by Moore *et al.* (2000b) in the Alaska Beaufort Sea during which six sightings of bowhead whales were documented in water greater than 2,000 m (6,561.7 ft). A mean group size of bowhead whale sightings in September, in waters greater than 2,000 m deep, was calculated to be 1.14 (CV = 0.4) from BWASP data. A $f(0)$ value of 2.33 and $g(0)$ value of 0.073, both from Thomas *et al.* (2002) were used to estimate a summer density for bowhead whales of 0.0122 whales/km². This density falls within the range of densities, *i.e.*, 0.0099 to 0.0717 whales/

km², reported by Lyons and Christie (2009) based on data from three July, 2008 surveys.

Treacy *et al.* (2006) reported that in years of heavy ice conditions, bowhead whales occur farther offshore than in years of light to moderate ice. NSIDC (2009) reported that September, 2009 had the third lowest sea ice extent since the start of their satellite records in 1979. The extent of sea ice at the end of the 2009 Arctic summer, however, was greater than in 2007 or 2008. USGS does not expect 2010 to be a heavy ice year during which bowhead whales might occur farther offshore in the area of the proposed survey. During the lowest ice-cover year on record (2007), BWASP reported no bowhead whale sightings in the greater than 2,000 m depth waters far offshore. Because few bowhead whales have been documented in the deep offshore waters of the proposed survey area, half of the bowhead whale density estimate from size and standard error reported in Thomas *et al.* (2002) for $f(0)$ and $g(0)$ correction factors suggest that an inflation factor of two is appropriate for estimating the maximum density from the average density. NSIDC did not forecast that 2010 would be a heavy ice year and USGS anticipates that bowheads will remain relatively close to shore, and in areas of light ice coverage. Therefore, USGS has applied the same density for bowheads to the open-water and ice-margin categories. Bowhead whales were not sighted during recent surveys in the Arctic Ocean (Haley and Ireland, 2006; Haley, 2006; GSC unpublished data, 2008; Mosher *et al.*, 2009), suggesting that the bowhead whale densities shown in Table 5 are likely higher than actual densities in the survey area.

For other cetacean species that may be encountered in the Beaufort Sea, densities are likely to be very low in the summer when the survey is scheduled. Fin and humpback whales are unlikely to occur in the Beaufort Sea. No gray whales were observed in the Beaufort Sea by Moore *et al.* (2000b) during summer aerial surveys in water greater than 2,000 m. Gray whales were not recorded in water greater than 2,000 m by the BWASP during August in 29 years of survey operation. Harbor porpoises are not expected to be present in large numbers in the Beaufort Sea during the fall although small numbers may be encountered during the summer. Neither gray whales nor harbor porpoises are likely to occur in the far-offshore waters of the proposed survey area (Table 5 of the IHA application). Narwhals are not expected to be encountered within the survey area

although a few individuals could be present if ice is nearby. Because these species occur so infrequently in the Beaufort Sea, little to no data are available for the calculation of densities. Minimal cetacean densities have therefore been assigned to these three species for calculation purposes and to allow for chance encounters (see Table 5 of the IHA application). Those densities include "0" for the average and 0.0001 individuals/km² for the maximum.

Pinnipeds—Extensive surveys of ringed and bearded seals have been conducted in the Beaufort Sea, but most surveys were conducted over the landfast ice during aerial surveys, and few seal surveys have occurred in open water or in the pack ice. Kingsley (1986) conducted ringed seal surveys of the offshore pack ice in the central and eastern Beaufort Sea during the late spring (late June). These surveys provide the most relevant information on densities of ringed seals in the ice margin zone of the Beaufort Sea. The density estimate in Kingsley (1986) was used as the average density of ringed seals that may be encountered in the ice-margin area of the proposed survey (see Table 5 of the IHA application). The average density was multiplied by four to estimate maximum density, as was done for all seal species likely to occur within the survey area. Ringed seals are closely associated with sea ice therefore the ice-margin densities were multiplied by a factor of 0.75 to estimate a summer open-water ringed-seal density for locations with water depth greater than 2,000 m (6,561.7 ft).

Densities of bearded seals were estimated by multiplying the ringed seal densities by 0.051 based on the proportion of bearded seals to ringed seals reported in Stirling *et al.*, (1982; see Table 6–3 of IHA application). Because bearded seals are associated with the pack ice edge and shallow water, their estimated summer ice-margin density was also multiplied by a factor of 0.75 for the open-water density estimate. Minimal values were used to estimate spotted seal densities because they are uncommon offshore in the Beaufort Sea and are not likely to be encountered.

Numbers of marine mammals that might be present and potentially disturbed are estimated below based on available data about marine mammal distribution and densities in the three different habitats during the summer as described in Table 5 of the IHA application.

The number of individuals of each species potentially exposed to received levels greater than or equal to 160 dB re

1 μ Pa (rms) (for seismic airgun operations) or 120 dB re 1 μ Pa (rms) (for icebreaking) was estimated by multiplying:

- The anticipated area to be ensonified to the specified sound level in both open water, the ice margin, and polar pack by

- The expected species density.

Some of the animals estimated to be exposed to sound levels greater than or equal to 160 dB re 1 μ Pa (rms) or 120 dB re 1 μ Pa (rms), particularly migrating bowhead whales, might show avoidance reactions before actual exposure to this sound level (see Appendix D of the IHA application). Thus, these calculations actually estimate the number of individuals potentially exposed to greater than or equal to 160 dB (rms) or 120 dB re 1 μ Pa (rms) that would occur if there were no avoidance of the area ensonified to that level.

Estimated Area Exposed to ≥ 160 dB (rms)

The area of water potentially exposed to received levels greater than or equal to 160 dB by the proposed operations was calculated by multiplying the planned trackline distance within U.S. waters by the cross-track distance of the sound propagation. The airgun array of two 500 in³ and one 150 in³ G-airguns that will be used for the proposed 2010 survey within U.S. waters was measured during a 2009 project in the Arctic Ocean. The propagation experiment took place at 74°50.4' North; 156°34.31' West, in 3,863 m (12,674 ft) of water. The location was near the northern end of the two proposed survey lines in U.S. waters. USGS expects the sound propagation by the airgun array in the planned 2010 survey will be the same as that measured in 2009, because of the similar water depths and relative locations of the test site and proposed survey area. The greater than or equal to 160 dB (rms) sound level radius was estimated to be approximately 2,500 m (8,202.1 ft) based on modeling of the 0 to peak energy of the airgun array (Roth and Schmidt, 2010). The 0 to peak values were corrected to rms by subtracting 10 dB.

Closely spaced survey lines and large cross-track distances of the greater than or equal to 160 dB radii can result in repeated exposure of the same area of water. Excessive amounts of repeated exposure can lead to overestimation of the number of animals potentially exposed through double counting. The trackline for the proposed USGS survey in U.S. waters, however, covers a large geographic area without adjacent tracklines and the potential for multiple

or repeated exposure is unlikely to be a concern.

The USGS 2010 geophysical survey is planned to occur approximately 108 km (67.1 mi) offshore, along approximately 806 km (501 mi) of survey lines in U.S. waters, during the first half of August exposing a total of approximately 4,109 km² (1,586.5 mi²) of water to sound levels of greater than or equal to 160 dB (rms). USGS included an additional 25 percent allowance over and above the planned tracklines within U.S. waters to allow for turns, lines that might have to be repeated because of poor data quality, or for minor changes to the survey design. The resulting estimate of 5,136.5 km² (1,983.2 mi²) was used to estimate the numbers of marine mammals exposed to underwater sound levels greater than or equal to 160 dB (rms).

Based on the operational plans and marine mammal densities described in Table 5 of the IHA application, the estimates of marine mammals potentially exposed to sounds greater than or equal to 160 dB (rms) in the proposed survey area within U.S. waters are presented in Table 6 of the IHA application. For the common species, the requested numbers are calculated as described above and based on the average densities from the data reported in the different studies mentioned above. For less common species, estimates were set to minimal values to allow for chance encounters. Discussion of the number of potential exposures is summarized by species in the following subsections.

Cetaceans—Based on density estimates and area ensonified, one endangered cetacean species (bowhead whale) is expected by USGS to be exposed to received levels greater than or equal to 160 dB, unless bowheads avoid the survey vessel before the received levels reach 160 dB. Migrating bowheads are likely to do so, though many of the bowheads engaged in other activities, particularly feeding and socializing may not. The USGS estimated the number of bowhead whales potentially exposed to sound levels ≥ 160 dB (rms) in the portion of the survey area in U.S. waters to be between 31 and 63 (see Table 6 of the IHA application). NMFS subsequently did an analysis and found that bowhead whales are unlikely to be exposed to sound levels ≥ 160 dB (rms). Although take was calculated based on density estimates in the proposed action area, the proposed seismic survey will be conducted during the fall migration for bowhead whales, but at locations starting at greater than 185.2 km (100 nmi) offshore, well north of the known

bowhead migration corridor and well beyond distances (20 to 30 km [12.4 to 18.6], Miller *et al.*, 1999; Richardson *et al.*, 1999) known to potentially affect this species. Other endangered cetacean species that may be encountered in the area are fin and humpback whales; both are unlikely to be exposed given their minimal density in the area.

The only other cetacean species likely to occur in the proposed survey area is the beluga whale. Average (best) and maximum estimates of the number of exposures of belugas to sound levels greater than or equal to 160 dB (rms) are 182 and 364, respectively. Estimates for other cetacean species are minimal (see Table 6 of the IHA application).

Pinnipeds—The ringed seal is the most widespread and abundant pinniped in ice-covered arctic waters, and there is a great deal of annual variation in abundance and distribution of these marine mammals. Ringed seals account for the vast majority of marine mammals expected to be encountered, and hence exposed to airgun sounds with received levels greater than or equal to 160 dB (rms) during the proposed marine seismic survey. The average (best and maximum number of exposures of ringed seals to sound levels greater than or equal to 160 dB (rms) were estimated to be 1,031 and 4,126, respectively.

Two additional pinniped species (other than the Pacific walrus) are likely to occur in the proposed project area. The average and maximum numbers of exposures of bearded seals to sound levels greater than or equal to 160 dB (rms) were estimated to be 53 and 210, respectively. The ribbon seal is unlikely to be encountered in the survey area, but a chance encounter could occur.

Estimated Area Exposed to ≥ 120 dB (rms)

The area potentially exposed to received levels greater than or equal to 120 dB (rms) due to icebreaking operations was estimated by multiplying the anticipated trackline distance breaking ice by the estimated cross-track distance to received levels of 120 dB caused by icebreaking.

In 2008, acousticians from Scripps Institution of Oceanography Marine Physical Laboratory and University of New Hampshire Center for Coastal and Ocean Mapping conducted measurements of SPLs of *Healy* icebreaking under various conditions (Roth and Schmidt, 2010). The results indicated that the highest mean SPL (185 dB [rms]) was measured at survey speeds of 4 to 4.5 knots in conditions of $\frac{5}{10}$ ice and greater. Mean SPL under conditions where the ship was breaking

heavy ice by backing and ramming was actually lower (180 dB). In addition, when backing and ramming, the vessel is essentially stationary, so the ensonified area is limited for a short period (on the order of minutes to tens of minutes) to the immediate vicinity of the boat until the ship breaks free and once again makes headway.

Although the report by Roth and Schmidt has not yet been reviewed externally nor peer-reviewed for publication, the SPL results reported are consistent with previous studies (Thiele, 1981, 1988; LGL and Greenridge, 1986; Richardson *et al.*, 1995).

The existing threshold for Level B harassment for continuous sounds is a received sound level of 120 dB SPL. Using a spherical spreading model, a source level of 185 dB decays to 120 dB in about 1,750 m (5,741.5 ft). This model is corroborated by Roth and Schmidt (2010). Therefore, as the ship travels through the ice, a swath 3,500 m (11,483 ft) wide would be subjected to sound levels greater than or equal to 120 dB (rms). This results in the potential exposure of 11,802 km² (4,557.8 mi²) to sounds greater than or equal to 120 dB (rms) from icebreaking.

Based on the operational plans and marine mammal densities described above, the estimates of marine mammals exposed to sounds greater than or equal to 120 dB (rms) during the maximum estimation of icebreaking outside of U.S. waters (3,372 km [2,095.3 mi]) are presented in Table Add-4 of the IHA application. For the common marine mammal species, the requested numbers are calculated as described above and based on the average densities from the data reported in the different studies mentioned above. For less common species, estimates were set to minimal values to allow for chance encounters.

Based on models, bowhead whales likely would respond to the sound of the icebreakers at distances of 2 to 25 km (1.2 to 15.5 mi) from the icebreakers (Miles *et al.*, 1987). This study predicts that roughly half of the bowhead whales show avoidance responses to an icebreaker underway in open water at a range of 2 to 12 km (1.3 to 7.5 mi) when the sound-to-noise ratio is 30 dB (rms). The study also predicts that roughly half of the bowhead whales would show avoidance response to an icebreaker pushing ice at a range of 4.6 to 6.2 km (2.9 to 12.4 mi) when the sound-to-noise ratio is 30 dB.

Richardson *et al.* (1995b) found that bowheads migrating in the nearshore lead during the spring migration often tolerated exposure to playbacks of recorded icebreaker sounds at received

levels up to 20 dB or more above the natural ambient noise levels at corresponding frequencies. The source level of an actual icebreaker is much higher than that of the projectors (projecting the recorded sound) used in this study (median difference 34 dB over the frequency range 40 Hz to 6.3 kHz). Over the two-season period (1991 and 1994) when icebreaker playbacks were attempted, an estimated 93 bowheads (80 groups) were seen near the ice camp when the projectors were transmitting icebreaker sounds into the water, and approximately 158 bowheads (116 groups) were seen near there during quiet periods. Some bowheads diverted from their course when exposed to levels of projected icebreaker sound greater than 20 dB above the natural ambient noise level in the $\frac{1}{3}$ octave band of the strongest icebreaker noise. However, not all bowheads diverted at that sound-to-noise ratio, and a minority of whales apparently diverted at a lower sound-to-noise ratio. The study concluded that exposure to a single playback of variable icebreaker sounds can cause statistically, but probably not biologically significant effects on movements and behavior of migrating whales in the lead system during the spring migration east of Point Barrow, Alaska. The study indicated the predicted response distances for bowheads around an actual icebreaker would be highly variable; however, for typical traveling bowheads, detectable effects on movements and behavior are predicted to extend commonly out to radii of 10 to 30 km (6.2 to 18.6 mi). Predicting the distance a whale would respond to an icebreaker like the *Healy* is difficult because of propagation conditions and because ambient noise varies with time and with location. However, because the closest survey activities and icebreaking are approximately 116 km (72.1 mi) away and are of limited duration (5 days), and the next closest survey activities are 397 km (246.7 mi) away to the north and west in the Arctic ocean, NMFS does not anticipate that icebreaking activities would have biologically significant effects on the movements and behavior of bowhead whales.

Table 6 (see below) outlines the species, estimated stock population (minimum and best), and estimated percentage of the regional population or stock exposed to seismic pulses and icebreaking activities in the project area. Additional information regarding the status, abundance, and distribution of the marine mammals in the action area and how densities were calculated was included in Table 4 (see above), the

notice of the proposed IHA (75 FR 39337, July 8, 2010) and may be found in USGS's application.

TABLE 6—THE ESTIMATES OF THE POSSIBLE NUMBERS OF MARINE MAMMALS EXPOSED TO SOUND LEVELS GREATER THAN OR EQUAL TO 120 dB (RMS) (FOR ICEBREAKING) OR 160 dB (RMS) (FOR SEISMIC AIRGUN OPERATIONS) DURING USGS'S PROPOSED SEISMIC SURVEY IN U.S. WATERS IN THE NORTHERN BEAUFORT SEA AND ARCTIC OCEAN, IN AUGUST 2010. RECEIVED LEVELS ARE EXPRESSED IN dB RE 1 μ PA (RMS) (AVERAGED OVER PULSE DURATION), CONSISTENT WITH NMFS' PRACTICE. NOT ALL MARINE MAMMALS WILL CHANGE THEIR BEHAVIOR WHEN EXPOSED TO THESE SOUND LEVELS, BUT SOME MAY ALTER THEIR BEHAVIOR WHEN LEVELS ARE LOWER (SEE TEXT). SEE TABLES 4 TO 5 AND ADD-3 AND ADD-4 IN USGS'S APPLICATION FOR FURTHER DETAIL.

Species	# of individuals exposed (best) ¹ open water, ice margin, polar pack	# of individuals exposed (max) ² open water, ice margin, polar pack	Total (best)	Approx. percent of regional population (best) ²
Odontocetes:				
Beluga whale (<i>Delphinapterus leucas</i>)	146	291	224	0.57
	36	73		
	42	84		
Narwhal (<i>Monodon monocerus</i>)	0	1	0	0
	0	1		
	0	1		
Killer whale (<i>Orcinus orca</i>)	0	0	0	0
	0	0		
	0	1		
Harbor porpoise (<i>Phocoena phocoena</i>)	0	0	0	0
	0	0		
	0	1		
Mysticetes:				
Bowhead whale (<i>Balaena mysticetus</i>)	N.A.	N.A.	N.A.	N.A.
Eastern Pacific gray whale (<i>Eschrichtius robustus</i>)	0	0	0	0
	0	0		
	0	1		
Minke whale (<i>Balaenoptera acutorostrata</i>)	0	0	0	0
	0	0		
	0	1		
Fin whale (<i>Balaenoptera physalus</i>)	0	0	0	0
	0	0		
	0	1		
Humpback whale (<i>Megaptera novaeangliae</i>)	0	0	0	0
	0	0		
	0	0		
Pinnipeds:				
Bearded seal (<i>Erignathus barbatus</i>)	39	158	67	0.02
	13	53		
	15	60		
Spotted seal (<i>Phoca largha</i>)	0	2	0	0
	0	0		
	0	0		
Ringed seal (<i>Phoca hispida</i>)	774	3,094	1,328	7.38
	258	1,031		
	296	1,185		
Ribbon seal (<i>Histiophoca fasciata</i>)	N.A.	N.A.	N.A.	N.A.
Pacific walrus (<i>Odobenus rosmarus divergens</i>)	N.A.	N.A.	N.A.	N.A.
Carnivores:				
Polar bear (<i>Ursus maritimus marinus</i>)	N.A.	N.A.	N.A.	N.A.

N.A.—Data not available or species status was not assessed.

¹ Best estimate and maximum density estimates are from Table 5 and Table Add-3 of USGS's application.

² Regional population size estimates are from Table 4.

Conclusions—Bowhead whales are considered by NMFS to be disturbed after exposure to underwater sound levels greater than or equal to 160 dB (rms) for impulse sources and 120 dB (rms) for continuous sources. The relatively small airgun array proposed for use in this survey limits the size of the 160 dB (rms) EZ around the vessel

and is not expected to result in any bowhead whale exposures to underwater sound levels sufficient to reach the disturbance criterion as defined by NMFS.

Odontocete reactions to seismic energy pulses are usually assumed to be limited to lesser distances from the airgun(s) than are those of mysticetes,

probably in part because odontocete low-frequency hearing is assumed to be less sensitive than that of mysticetes. However, at least when in the Canadian Beaufort Sea in summer, belugas appear to be fairly responsive to seismic energy, with few being sighted within 10 to 20 km (6.2 to 12.4 mi) of seismic vessels during aerial surveys (Miller *et al.*,

2005). Belugas will likely occur in small numbers in the project area within U.S. waters during the survey period. Most belugas will likely avoid the vicinity of the survey activities and few will likely be affected.

Taking into account the mitigation measures that are planned, effects on cetaceans are generally expected to be restricted to avoidance of a limited area around the survey operation and short-term changes in behavior, falling within the MMPA definition of "Level B harassment." Furthermore, the estimated numbers of animals potentially exposed to sound levels sufficient to cause appreciable disturbance are very low percentages of the population sizes in the Bering-Chukchi-Beaufort Seas.

Based on the ≥ 160 dB disturbance criterion, the best estimates of the numbers of cetacean exposures to sounds ≥ 160 dB re 1 μ Pa (rms) represent less than one percent of the populations of each species in the Chukchi Sea and adjacent waters. For species listed as Endangered under the ESA, USGS estimates suggest it is unlikely that fin whales, or humpback whales will be exposed to received levels ≥ 160 dB and/or ≥ 120 dB, but that approximately 38 bowheads (0.36 percent of the regional population) may be exposed at this level. The latter is less than one percent of the Bering-Chukchi-Beaufort population of greater than 14,247 animals assuming 3.4 percent population growth from the 2001 estimate of greater than 10,545 animals (Zeh and Punt, 2005). NMFS subsequently did an analysis, and found that bowheads are unlikely to be exposed to sound levels ≥ 160 dB (rms) from airgun operations and/or ≥ 120 dB (rms) from icebreaking activities. NMFS does not anticipate bowhead whales to be potentially affected by the proposed survey activities due to its location far offshore of the bowhead fall migration pathway.

Some monodontids may be exposed to sounds produced by the airgun arrays during the proposed survey, and the numbers potentially affected are small relative to the population sizes (see Table 6 of the IHA application). The best estimate of the number of belugas (224 animals) that might be exposed to ≥ 160 dB and/or ≥ 120 dB represents less than one percent (0.57 percent) of their regional population.

The many reported cases of apparent tolerance by cetaceans of seismic exploration, vessel traffic, and some other human activities show that co-existence is possible. Monitoring and mitigation measures such as controlled vessel speed, dedicated PSOs, non-pursuit, shut-downs or power-downs

when marine mammals are seen within defined ranges will further reduce short-term reactions and minimize any effects on hearing sensitivity. In all cases, the effects are expected to be short-term, with no lasting biological consequence.

Several pinniped species may be encountered in the study area, but the ringed seal is by far the most abundant marine mammal species in the survey area. The best (average) estimates of the numbers of individual seals exposed to airgun sounds at received levels ≥ 160 dB re 1 μ Pa (rms) and/or ≥ 120 dB re 1 μ Pa (rms) for icebreaking during the marine survey are as follows: Ringed seals (1,328 animals; 7.4 percent of the regional population), bearded seals (67 animals; 0.02 percent of the regional population), and spotted seals (0 animals, 0 percent of the regional population), representing less than a few percent of the Bering-Chukchi-Beaufort populations for each species. It is probable that only a small percentage of the pinnipeds exposed to sound level ≥ 160 dB (rms) or 120 dB (rms) would actually be disturbed. The short-term exposures of pinnipeds to airgun sounds are not expected to result in any long-term negative consequences for the individuals or their populations.

Potential Effects on Habitat

The proposed USGS seismic survey will not result in any permanent impact on habitats used by marine mammals, including the food sources they use. The proposed activities will be of short duration in any particular area at any given time; thus any effects would be localized and short-term. The main impact associated with the proposed activity will be temporarily elevated noise levels and the associated direct effects on marine mammals, as described above.

Icebreaking could alter ice conditions in the immediate area around the vessels. However, ice conditions at this time of year are typically highly variable and relatively unstable in most locations the survey will take place. Although there is the potential for the destruction of ringed seal lairs or polar bear dens due to icebreaking, these animals will not be using lairs or dens at the time of the planned survey.

One of the reasons for the adoption of airguns as the standard energy source for marine seismic surveys was that, unlike explosives, they do not result in any appreciable fish kill. However, the existing body of information relating to the impacts of seismic on marine fish and invertebrate species, the primary food sources of pinnipeds and belugas, is very limited.

In water, acute injury and death of organisms exposed to seismic energy depends primarily on two features of the sound source: (1) The received peak pressure, and (2) the time required for the pressure to rise and decay (Hubbs and Rechnitzer, 1952; Wardle *et al.*, 2001). Generally, the higher the received pressure and less time required for the pressure to rise and decay, the greater the chance of acute pathological effects. Considering the peak pressure and rise/decay time characteristics of seismic airgun arrays used today, the pathological zone for fish and invertebrates would be expected to be within a few meters of the seismic source (Buchanan *et al.*, 2004). For the proposed survey, any injurious effects on fish would be limited to very short distances from the sound source and well away from the nearshore waters where most subsistence fishing activities occur.

The survey off of northern Alaska will occur in an area designated as Essential Fish Habitat (EFH) for Arctic cod (*Arctogadus glacialis*) (NPFMC, 2009). The approximately 806 km (435 nmi) of seismic survey lines that will be conducted in U.S. waters represents the maximum possible extent of potential EFH that would be ensonified during the project; the border of the U.S. EEZ defines the potential Arctic cod EFH boundary for Arctic cod. Effects on managed EFH species (Arctic cod) by the seismic operations assessed here would be temporary and minor. The main effect would be short-term disturbance that might lead to temporary and localized relocation of the EFH species or their food. The actual physical and chemical properties of the EFH will not be impacted. The only other designated Essential Fish Habitat (EFH) species that may occur in the area of the project during the seismic survey are salmon (adult), and their occurrence in waters north of the Alaska coast is limited. Adult fish near seismic operations are likely to avoid the immediate vicinity of the source, thereby avoiding injury (see Appendix E of the IHA application). No EFH species will be present as very early life stages when they would be unable to avoid seismic exposure that could otherwise result in minimal mortality.

Studies have been conducted on the effects of seismic activities on fish larvae and a few other invertebrate animals. Generally, seismic was found to only have potential harmful effects to larvae and invertebrates that are in direct proximity (a few meters) of an active airgun array (see Appendix E and F of the IHA application). The proposed Arctic Sea seismic program for 2010 is

predicted to have negligible to low physical effects on the various life stages of fish and invertebrates. Therefore, physical effects of the proposed program on fish and invertebrates would not be significant.

The *Healy* is designed for continuous passage at 5.6 km (3 knots) through ice 1.4 m (4.6 ft) thick. During this project the *Healy* will typically encounter first- or second-year ice while avoiding thick ice floes, particularly large intact multi-year ice, whenever possible. In addition, the icebreaker will follow leads when possible while following the survey route. As the icebreaker passes through the ice, the ship causes the ice to part and travel alongside the hull. This ice typically returns to fill the wake as the ship passes. The effects are transitory, i.e., hours at most, and localized, i.e., constrained to a relatively narrow swath perhaps 10 m (32.8 ft) to each side of the vessel.

The *Healy's* maximum beam is 25 m (82 ft). Applying the maximum estimated amount of icebreaking, i.e., 3,372 km (2,095.3 mi), to the corridor opened by the ship, USGS anticipates that a maximum of approximately 152 km² (58.7 mi²) of ice may be disturbed. This encompasses an insignificant amount (less than 0.005 percent) of the total Arctic ice extent in August and September of 2008 and 2009 which ranged from 3.24 million to 4.1 million km² (1,235,527 to 1,583,019 mi²).

Potential Effects on Marine Mammal Habitat

A detailed discussion of the potential effects of this action on marine mammal habitat, including physiological and behavioral effects on marine fish and invertebrates was included in the proposed IHA (75 FR 39336, July 8, 2010). Based on the discussion in the proposed IHA notice and the nature of the activities (limited duration), the authorized operations are not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations or stocks. Similarly, any effects to food sources are expected to be negligible.

The airgun operations will not result in any permanent impact on habitats used by marine mammals, or to the food sources they use. The main impact issue associated with the activities will be temporarily elevated noise levels and the associated direct effects on marine mammals, as well as the potential effects of icebreaking, as described above. The potential effects of icebreaking include locally altered ice conditions which may temporarily alter the haul-out pattern of seals in the

immediate vicinity of the vessel. The destruction of ringed seal lairs or polar bear dens is not expected to be a concern at this time of year.

Mitigation

In order to issue an Incidental Take Authorization (ITA) for small numbers of marine mammals under Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses. For the proposed seismic survey in the Arctic Ocean, USGS will deploy an airgun array of three G-airguns. The source will be relatively small in size and source level, relative to airgun arrays typically used for industry seismic surveys. Important mitigation factors built into the design of the survey include the following:

- In deep offshore waters (where the survey will occur), sound from the airguns is expected to attenuate relatively rapidly as compared with attenuation in shallower waters;
- The airguns comprising the array will be clustered with only limited horizontal separation (see Appendix B of the IHA application), so the arrays will be less directional than is typically the case with larger airgun arrays. This will result in less downward directivity than is often present during seismic surveys, and more horizontal propagation of sound; and
- Airgun operations will be limited to offshore waters, far from areas where there is subsistence hunting or fishing, and in waters where marine mammal densities are generally low.

In addition to the mitigation measures that are built into the general project design, several specific mitigation measures will be implemented to avoid or minimize effects on marine mammals encountered along the tracklines. These include ramping-up the airguns at the beginning of operations, and power-downs or shut-downs when marine mammals are detected within specified distances from the source. The GSC has written a Categorical Declaration (see Appendix C of the IHA application) stating that: "While in U.S. waters (i.e., the U.S. 200 mile EEZ), the GSC operators will comply with any and all environmental mitigation measures required by the U.S. National Marine Fisheries Service (NMFS) and/or the

U.S. Fish and Wildlife Service (USFWS)."

Received sound fields were measured for the airgun configuration, in relation to distance and direction from the airgun(s). The proposed radii around the airgun(s) where received levels would be 180 and 190 dB (rms) are shown in Table 2 of the IHA application. The 180 and 190 dB (rms) levels are used to initiate a power-down or, if necessary, shut-down criteria applicable to cetaceans and pinnipeds, respectively, as specified by NMFS (2000).

Vessel-based PSOs will watch for marine mammals near the airgun(s) when they are in use. Mitigation and monitoring measures proposed to be implemented for the seismic survey have been developed and refined in cooperation with NMFS during previous seismic studies in the Arctic and described in associated EAs, IHA applications, and IHAs. The mitigation and monitoring measures described herein represent a combination of the procedures required by past IHAs for Arctic projects.

Some cetacean species (such as bowhead whales) may be feeding or migrating in the Beaufort Sea during August and September. However, most of the proposed geophysical activities will occur north of the main migration corridor and the number of individual animals expected to closely approach the vicinity of the proposed activity will be small in relation to regional population sizes. With the monitoring, ramp-up, power-down, and shut-down provisions (see below), any effects on individuals are expected to be limited to behavioral disturbance. The following subsections provide more detailed information about the mitigation measures that are an integral part of the planned activity.

Exclusion Zones (EZ)

Mosher *et al.* (2009) collected received sound level data for the airgun configuration that will be used in the proposed survey in similar water depths, i.e., greater than 2,000 m (6,561.7 ft). The empirical data were plotted in relation to distance and direction from the three airguns by Roth and Schmidt (2010; see Figure B-3). Based on model fit to the measured received levels and source modeling estimates from Gundalf, the 180 and 190 dB (rms) EZ are estimated to be 216 m (708.7 ft) and 68 m (223.1 ft), respectively. As a conservative measure for the proposed EZ, the sound-level EZ indicated by the empirical data have been increased to 500 m (1,640.4 ft) for the 180 dB isopleths and to 100 m (328 ft) for the 190 dB isopleths (see Table 2

of the IHA application). The 180 and 190 dB levels are shut-down criteria applicable to cetaceans and pinnipeds, respectively, as specified by NMFS (2000); these levels were used to establish the EZs. If the PSO detects marine mammal(s) within or about to enter the appropriate EZ, the airguns will be powered-down (or shut-down if necessary) immediately (see below).

Detailed recommendations for new science-based noise exposure criteria were published in early 2008 (Southall *et al.*, 2007). USGS will be prepared to revise its procedures for estimating numbers of mammals "taken," EZs, etc., as may be required by any new guidelines that result. As yet, NMFS has not specified a new procedure for determining EZs. Such procedures, if applicable would be implemented through a modification to the IHA if issued.

In addition to monitoring, mitigation measures that will be adopted during the Arctic Ocean survey include:

(1) Speed or course alteration, provided that doing so will not compromise operational safety requirements;

(2) Power-down procedures;

(3) Shut-down procedures; and

(4) Ramp-up procedures.

No start-up of airgun operations would be permitted unless the full 180 dB (rms) EZ is visible for at least 30 min during day or night. Other proposed provisions associated with operations at night or in periods of poor visibility include the following:

- During foggy conditions or darkness (which may be encountered starting in late August), the full 180 dB (rms) EZ may not be visible. In that case, the airguns could not start-up after a full shut-down until the entire 180 dB (rms) radius was visible.

- During any nighttime operations, if the entire 180 dB (rms) EZ is visible using vessel lights, then start-up of the airgun array may occur following a 30 min period of observation without sighting marine mammals in the EZ.

- If one or more airguns have been operational before nightfall, they can remain operational throughout the night, even though the entire EZ may not be visible.

Speed or Course Alteration—If a marine mammal (in water) is detected outside the EZ and, based on its position and relative motion, is likely to enter the EZ, the vessel's speed and/or direct course may, when practical and safe, be changed in a manner that also minimizes the effect on the planned science objectives. The marine mammal activities and movements relative to the seismic vessel will be closely monitored

to ensure that the marine mammal does not approach within the EZ. If the mammal appears likely to enter the EZ, further mitigative actions will be taken, i.e., either further course alterations or power-down or shut-down of the airgun(s).

Power-down Procedures—A power-down involves reducing the number of airguns in use such that the radius of the 180 dB or 190 dB (rms) EZ are decreased to the extent that marine mammals are no longer in or about to enter the EZ. A power-down of the airgun array can also occur when the vessel is moving from one seismic line to another. During a power-down for mitigation, one airgun (or some other number of airguns less than the full airgun array) will be operated. The continued operation of one airgun is intended to alert (1) marine mammals to the presence of the seismic vessel in the area, and (2) retain the option of initiating a ramp-up to full operations under poor visibility conditions. In contrast, a shut-down occurs when all airgun activity is suspended.

If a marine mammal is detected outside the EZ but is likely to enter the EZ, and if the vessel's speed and/or course cannot be changed to avoid having the marine mammal enter the EZ, the airguns (as an alternative to a complete shut-down) will be powered-down to a single airgun before the animal is within the EZ. Likewise, if a mammal is already within the EZ when first detected, the airguns will be powered-down immediately if this is a reasonable alternative to a complete shut-down. During a power-down of the airgun array, the number of operating airguns will be reduced to a single 150 in³ G-airgun. The 180 dB (rms) EZ for the power-down sound source has been estimated to be 62 m (203 ft); the proposed distance for use by PSOs is 75 m (246 ft). If a marine mammal is detected within or near the smaller EZ around that single 150 in³ airgun (see Table 2 of USGS's application and Table 2 above), all airguns will be shut-down (see next subsection).

Following a power-down, operation of the full airgun array will not resume until the marine mammal is outside the EZ for the full array. The animal will be considered to have cleared the EZ if it:

(1) Is visually observed to have left the EZ, or

(2) Has not been seen within the EZ for 15 minutes in the case for species with shorter dive durations (e.g., small odontocetes and pinnipeds); or

(3) Has not been seen within the EZ for 30 minutes in the case for species with longer dive durations (e.g.,

mysticetes and large odontocetes, including killer whales).

During airgun operations following a power-down (or shut-down) whose duration has exceeded the limits specified above and subsequent animal departures, the airgun array will be ramped-up gradually. Ramp-up procedures are described below.

Shut-down Procedures—The operating airguns(s) will be shut-down if a marine mammal is detected within or approaching the EZ for a single airgun source (i.e., a power-down is not practical or adequate to reduce exposure to less than 190 or 180 dB (rms), as appropriate). Shut-downs will be implemented (1) if an animal approaches or enters the EZ of the single airgun after a power-down has been initiated, or (2) if an animal is initially seen within the EZ of a single airgun when more than one airgun (typically the full array) is operating. Airgun activity will not resume until the marine mammal has cleared the EZ, or until the PSO is confident that the animal has left the vicinity of the vessel (or the PSO not observing the animal(s) within the EZ for 15 or 30 min depending upon the species). Criteria for judging that the animal has cleared the EZ will be as described in the preceding subsection. Ramp-up procedures will be followed during resumption of full seismic operations after a shut-down of the airgun array.

Ramp-up Procedures—A ramp-up procedure will be followed when the airgun array begins operating after a specified period without airgun operations or when a power-down (or reduced airgun operations) has exceeded that specified duration period. The specified period depends on the speed of the source vessel, the size of the airgun array that is being used, and the size of the EZ, but is often about 10 min. NMFS normally requires that, once ramp-up commences, the rate of ramp-up be no more than 6 dB per 5 min period. Ramp-up will begin with a single airgun (the smallest airgun in the array). Airguns will be added in a sequence such that the source level of the array will increase in steps not exceeding 6 dB per 5 min period over a total duration of approximately 10 minutes. During ramp-up, the PSOs will monitor the EZ, and if marine mammals are sighted, a power-down or shut-down will be implemented as though the full array were operational.

If the complete 180 dB (rms) EZ has not been visible for at least 30 min prior to the start of operations in either daylight or nighttime, ramp-up will not commence unless at least one airgun (150 in³ or similar) has been operating

during the interruption of seismic survey operations. Given these provisions, it is likely that the three G-airgun array will not be ramped-up from a complete shut-down at night or in thick fog, because the outer part of the EZ for that array will not be visible during those conditions. If the entire EZ is visible using vessel lights, then start-up of the airguns from a complete shut-down may occur at night. If one airgun has operated during a power-down period, ramp-up to full power will be permissible at night or in poor visibility, on the assumption that marine mammals will be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away if they choose. Given the responsiveness of bowhead and beluga whales to airgun sounds, it can be assumed that those species in particular will move away during a ramp-up. Ramp-up of the airguns will not be initiated during the day or at night if a marine mammal is sighted within or near the applicable EZ during the previous 15 or 30 min, as applicable.

Helicopter Flights—The use of a helicopter to conduct ice reconnaissance flights and vessel-to-vessel personnel transfers is likely to occur during survey activities in U.S. waters. However, collection of spot bathymetry data or on-ice landings, both of which required low altitude flight patterns, will not occur in U.S. waters.

Monitoring and Reporting

In order to issue an ITA for an activity, Section 101(a)(5)(D) of the MMPA states that NMFS must set forth “requirements pertaining to the monitoring and reporting of such taking.” The MMPA implementing regulations at 50 CFR 216.104(a)(13) require that requests for IHAs 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.

USGS will sponsor marine mammal monitoring during the proposed project, in order to implement the mitigation measures that require real-time monitoring, to satisfy the anticipated monitoring requirements of the IHA, and to meet any monitoring requirements agreed to as part of the Plan of Cooperation. USGS’s Monitoring Plan is described below as well as in their IHA application.

The monitoring work described here has been planned as a self-contained project independent of any other related monitoring projects that may be occurring simultaneously in the same regions. USGS is prepared to discuss coordination of its monitoring program with any related work that might be done by other groups insofar as this is practical and desirable.

Vessel-based Visual Monitoring

Vessel-based Protected Species Observers (PSOs) will monitor for marine mammals near the seismic source vessel during all daytime airgun operations and during any nighttime start-ups of the airguns. The survey area within U.S. waters is located within high latitudes (approximately 72° to 74° North) and the project will take place during the summer when little darkness will be encountered (see Table 9 of the IHA application). Some periods of darkness will be encountered towards the end of the survey when there will be several hours between sunset and sunrise.

The PSO’s observations will provide the real-time data needed to implement the key mitigation measures. Airgun operations will be powered-down or (if necessary) shut-down when marine mammals are observed within, or about to enter, a designated EZ where there is a possibility of effects on hearing or other physical effects. Vessel-based PSOs will also watch for marine mammals near the seismic vessel for at least 30 min prior to the planned start of airgun operations after an extended shut-down of the airgun. When feasible, observations will also be made during daytime periods without seismic operations (e.g., during transits).

TABLE 7—THE DAYLIGHT TIMES AND PERIODS WITHIN THE PROPOSED PROJECT AREA FROM BEGINNING (AUGUST 7, 2010) TO END (SEPTEMBER 3, 2010) OF THE PLANNED SURVEY ACTIVITIES WITHIN LATITUDES OF THE PLANNED SURVEY WITHIN U.S. WATERS. TIME IS IN ALASKA DAYLIGHT TIME (AKDT)

Date	72° North		74° North	
	August 7	September 3	August 7	September 3
Sunrise	09:29	12:14	—	12:00
Sunset	06:42	03:45	—	03:59
Period of daylight (hours)	21:13	15:31	24:00	15:59

- During daylight, vessel-based PSOs will watch for marine mammals near the seismic vessel during all periods of airgun activity and for a minimum of 30 min prior to the planned start of airgun operations after an extended shut-down.
- Although there will be only a brief period during the survey when darkness will be encountered in U.S. waters, USGS proposes to conduct nighttime as well as daytime operations. PSOs dedicated to protected species observations are proposed not to be on duty during ongoing seismic operations at night, given the very limited effectiveness of visual observation at night. At night, bridge personnel will watch for marine mammals (insofar as

practical at night) and will call for the airguns to be shut-down if marine mammals are observed in or about to enter the EZ.

PSOs will be stationed aboard both the seismic source vessel (*St. Laurent*) and *Healy* during the proposed survey. The vessels will typically work together in tandem while making way through heavy ice with the *Healy* in the lead breaking ice and collecting multi-beam data. The *St. Laurent* will follow collecting seismic reflection and refraction data. In light ice conditions, the vessels will separate to maximize data collection. “Real-time” communication between the two vessels

regarding marine mammal detections will be available through VHF radio.

During operations in U.S. EEZ waters, a complement of five PSOs will work on the source vessel, the *St. Laurent*, and two will be stationed on the *Healy*. Three trained PSOs will board the *St. Laurent* in Kagluktuk, Nunavut, Canada. Three experienced PSOs and one Alaska Native community observer will be aboard the *Healy* at the outset of the project. Before survey operations begin in U.S. waters, two of the PSOs on the *Healy* will transfer to the *St. Laurent* to provide additional observers during airgun operations. When not surveying in U.S. waters, the distribution of PSOs

will return to three on the *St. Laurent* and four on the *Healy*.

PSOs on the *St. Laurent* will monitor for marine mammals during all daylight airgun operations. Airgun operations will be shut-down when marine mammals are observed within, or about to enter, a designated EZ (see below) where there may be a possibility of significant effects on hearing or other physical effects. PSOs on both the source vessel and the *Healy* will also watch for marine mammals within or near the EZ for at least 30 min prior to the planned start of airgun operations after an extended shut-down of the airgun array. When feasible, observations will also be made during periods without seismic operations (e.g., during transits). Environmental conditions will be recorded every half hour during PSO watch.

The PSOs aboard the *Healy* will also watch for marine mammals during daylight seismic activities conducted in both U.S. and international waters. They will maximize their time on watch but will not watch continuously, as will those on the *St. Laurent*, because they will not have mitigation duties and there will be only two PSOs aboard the *Healy*. The *Healy* PSOs will report sightings to the PSOs on the *St. Laurent* to alert them of possible needs for mitigation.

In U.S. waters, at least one observer, and when practical two observers, will monitor for marine mammals from the *St. Laurent* during ongoing daytime operations and nighttime start-ups (when darkness is encountered). Use of two simultaneous observers will increase the proportion of the animals present near the source vessel that are detected. PSOs will normally be on duty in shifts of no longer than four hours duration although more than one hour shift may be worked per day with a maximum of 12 hours of daily watch time. During seismic operations in international waters, PSOs aboard the *St. Laurent* will conduct eight hour watches. This schedule accommodates 24 hour/day monitoring by three PSOs which will be necessary during most of the survey when daylight will be continuous. *Healy* PSOs will limit watches to four hours in U.S. waters.

The *St. Laurent* crew will be instructed to assist in detecting marine mammals and implementing required mitigation (if practical). The crew will be given instruction on mitigation requirements and procedures for implementation of mitigation prior to the start of the seismic survey. Members of the *Healy* crew will be trained to monitor for marine mammals and asked to contact the *Healy* observers for

sightings that occur while the PSOs are off-watch.

The *St. Laurent* and *Healy* are suitable platforms for observations for marine mammals. When stationed on the flying bridge, eye level will be approximately 15.4 m (51 ft) above sea level on the *St. Laurent* and approximately 24 m (78.7 ft) above sea level on the *Healy*. On both vessels the PSO will have an unobstructed view around the entire vessel from the flying bridge. If surveying from the bridge of the *St. Laurent* or the *Healy* the PSO's eye level will be approximately 12.1 m (40 ft) above sea level or 21.2 m (69 ft) above sea level, respectively. The PSO(s) will scan the area around the vessel systematically with laser range finding binoculars and with the unaided eye.

The survey will be conducted at high latitudes and continuous daylight will persist through much of the proposed survey area through the month of August. Day length will decrease to approximately 18 hours in the northern portion of the survey area by about early September. Laser range-finding binoculars (Leica LRF 1200 laser rangefinder or equivalent) will be available to assist with distance estimation; this equipment is useful in training observers to estimate distances visually, but is generally not useful in measuring distances to animals directly.

When marine mammals are detected within or about to enter the designated EZ, the airgun(s) will be powered-down or shut-down immediately. The distinction between power-downs and shut-downs is described above and in the IHA application. Channels of communication between the PSOs and the airgun technicians will be established to assure prompt implementation of shut-downs when necessary as has been done in other recent seismic survey operations in the Arctic (e.g., Haley, 2006). During power-downs and shut-downs, PSOs will continue to maintain watch to determine when the animal(s) are outside the EZ. Airgun operations will not resume until the animal is outside the EZ. The animal will be considered to have cleared the EZ if it is visually observed to have left the EZ. Alternatively, in U.S. waters the EZ will be considered clear if the animal has not been seen within the EZ for 15 min for small odontocetes and pinnipeds or 30 min for mysticetes. Within international waters the PSOs will apply a 30 min period for all species.

PSO Data and Documentation

PSOs will record data to estimate the numbers of marine mammals exposed to various received sound levels and to

document apparent disturbance reactions or lack thereof. Data will be used to estimate numbers of animals potentially 'taken' by harassment (as defined in the MMPA). They will also provide information needed to order a power-down or shut-down of the seismic source when a marine mammal is within or near the EZ.

When a sighting is made, the following information about the sighting will be recorded:

(1) Species, group size, and age/size/sex categories (if determinable); behavior when first sighted and after initial sighting; heading (if consistent), bearing, and distance from seismic vessel; sighting cue; apparent reaction to the seismic source or vessel (e.g., none, avoidance, approach, paralleling, etc.); and behavioral pace.

(2) Time, location, heading, speed, activity of the vessel, sea state, visibility, and sun glare.

The data listed under (2) above will also be recorded at the start and end of each observation watch, and during a watch whenever there is a change in one or more of the variables.

All observations, as well as information regarding seismic source power-downs and shut-downs, will be recorded in a standardized format. Data will be entered into a custom database using a notebook computer. The accuracy of data entry will be verified by computerized data validity checks as the data are entered and by subsequent manual checking of the database. These procedures will allow initial summaries of data to be prepared during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical, and other programs for further processing and archiving.

Results for the vessel-based observations will provide:

(1) The basis for real-time mitigation (airgun power-down or shut-down).

(2) Information needed to estimate the number of marine mammals potentially taken by harassment, which must be reported to NMFS per terms of MMPA authorizations or regulations.

(3) Data on the occurrence, distribution, and activities of marine mammals in the area where the seismic study is conducted.

(4) Information to compare the distance and distribution of marine mammals relative to the source vessel at times with and without seismic activity.

(5) Data on the behavior and movement patterns of marine mammals seen at times with and without seismic activity.

A report on USGS activities and on the relevant monitoring and mitigation

results will be submitted to NMFS within 90 days after the end of the cruise. The report will describe the operations that were conducted and sightings of marine mammals near the operations. The report will be submitted to NMFS, providing full documentation of methods, results, and interpretation pertaining to all acoustic characterization work and vessel-based monitoring. The 90-day report will summarize the dates and locations of seismic operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities). The number and circumstances of ramp-ups, power-downs, shut-downs, and other mitigation measures will be reported. Sample size permitting, the report will also include estimates of the amount and nature of potential "take" of marine mammals.

All injured or dead marine mammals (regardless of cause) will be reported to NMFS as soon as practicable. The report will include species or description of animal, condition of animal, location, time first found, observed behaviors (if alive) and photo or video, if available.

Encouraging and Coordinating Research

USGS will coordinate the planned marine mammal monitoring program associated with the seismic survey in the Arctic Ocean with other parties that may have an interest in this area and/or be conducting marine mammal studies in the same region during operations. No other marine mammal studies are expected to occur in the main (northern) parts of the study area at the proposed time. However, other industry-funded seismic surveys may be occurring in the northeast Chukchi and/or western Beaufort Sea closer to shore, and those projects are likely to involve marine mammal monitoring. USGS has coordinated, and will continue to coordinate, with other applicable Federal, State and Borough agencies, and will comply with their requirements.

Negligible Impact and Small Numbers of Marine Mammals Analysis and Determination

The Secretary, in accordance with paragraph 101(a)(5)(D) of the MMPA, shall authorize the take of small numbers of marine mammals incidental to specified activities other than commercial fishing within a specific geographic region if, among other things, he determines that the authorized incidental take will have a "negligible impact" on species or stocks affected by the authorization. NMFS implementing regulations codified at 50

CFR 216.103 states that a "negligible impact is an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Based on the analysis contained herein, of the likely effects of the specified activity on marine mammals and their habitat within the specific area of study for the Arctic Ocean marine geophysical survey, and taking into consideration the implementation of the mitigation and monitoring measures NMFS, on behalf of the Secretary, found that USGS's proposed activities would result in the incidental take of small numbers of marine mammals, by Level B harassment only, and that the total taking from the proposed seismic survey would have a negligible impact on the affected species or stocks of marine mammals. As a basis for its small numbers determination, NMFS evaluated the number of individuals taken by Level B harassment relative to the size of the stock or population.

While the number of marine mammals potentially incidentally harassed will depend on the distribution and abundance of marine mammals in the vicinity of the survey activity, the number of potential Level B incidental harassment takings (see Table 6 above) is estimated to be small, less than a few percent of any of the estimated population sizes based on the data disclosed in Tables 4 and 6 of this notice, and has been mitigated to the lowest level practicable through the incorporation of the monitoring and mitigation measures mentioned previously in this document. Tables 4 and 6 in this notice disclose the habitat regional abundance, conservation status, density, and the number of individuals exposed to sound levels greater than or equal to 120 dB (rms) (for icebreaking) or 160 dB (rms) (for seismic airgun operations). Also, there are no known important reproductive or feeding areas in the proposed action area.

For reasons stated previously in this document, the specified activities associated with the proposed survey are not likely to cause TTS, PTS or other non-auditory injury, serious injury, or death to affected marine mammals because:

(1) The likelihood that, given sufficient notice through relatively slow ship speed, marine mammals are expected to move away from a noise source that is annoying prior to its becoming potentially injurious;

(2) The fact that cetaceans and pinnipeds would have to be closer than 500 m (1,640.4 ft) and 30 m (98.4 ft), in

deep water when the full array is in use at tow depth from the vessel to be exposed to levels of sound (180 dB and 190 dB, respectively) believed to have even a minimal chance of causing PTS;

(3) The fact that marine mammals would have to be closer than 2,500 m (8,202.1 ft) in deep water when the full array is in use at tow depth from the vessel to be exposed to levels of sound (160 dB) believed to have even a minimal chance of causing TTS; and

(4) The likelihood that marine mammal detection ability by trained observers is high at that short distance from the vessel.

As a result, no take by injury, serious injury, or death is anticipated or authorized, and the potential for temporary or permanent hearing impairment is very low and will be avoided through the incorporation of the proposed monitoring and mitigation measures.

In making a negligible impact determination NMFS evaluated factors such as: no anticipated injury, serious injury or mortality; the number, nature, intensity and duration of harassment (all relatively limited); the low probability that take will likely result in effects to annual rates of recruitment of survival; the context in which it occurs (*i.e.*, impacts to areas of significance, impacts to local populations, and cumulative impacts when taking into account successive/contemporaneous actions when added to baseline data); the status of stock or species of marine mammal (*i.e.*, depleted, not depleted, decreasing, increasing, stable, impact relative to the size of the population); impacts on habitat affecting rates of recruitment/survival; and the effectiveness of monitoring and mitigation measures.

Impact on Availability of Affected Species for Taking for Subsistence Uses

There is subsistence hunting for marine mammals in the waters off of the coast of Alaska, in the Arctic Ocean, that implicates MMPA Section 101(a)(5)(D). Subsistence hunting and fishing continue to be prominent in the household economies and social welfare of some Alaska residents, particularly among those living in small, rural villages (Wolfe and Walker, 1987; Braund and Kruse, 2009). Subsistence remains the basis for Alaska Native culture and community. In rural Alaska, subsistence activities are often central to many aspects of human existence, including patterns of family life, artistic expression, and community religious and celebratory activities.

Subsistence Hunting

Marine mammals are legally hunted in Alaskan waters by coastal Alaska Natives; species hunted include bowhead and beluga whales; ringed, spotted, and bearded seals; walruses, and polar bears. The importance of each of the various species varies among the communities based largely on availability. Bowhead whales, belugas, and walruses are the marine mammal species primarily harvested during the time of the proposed seismic survey. Subsistence remains the basis for Alaska Native culture and community, and subsistence activities are often central to many aspects of human existence, including patterns of family life, artistic expression, and community religious and celebratory activities.

Bowhead whale hunting is a key activity in the subsistence economies of Barrow and other Native communities

along the Beaufort Sea coast. The whale harvests have a great influence on social relations by strengthening the sense of Inupiat culture and heritage in addition to reinforcing family and community ties.

An overall quota system for the hunting of bowhead whales was established by the International Whaling Commission in 1977. The quota is now regulated through an agreement between NMFS and the Alaska Eskimo Whaling Commission (AEWC) which extends to 2012 (NMFS, 2008b). The AEWC allocates the number of bowhead whales that each whaling community may harvest annually during five-year periods (USDI/BLM, 2005; NMFS, 2008).

The community of Barrow hunts bowhead whales in both the spring and fall during the whales' seasonal migration along the coast (see Figure 2

of the IHA application). Often the bulk of the Barrow bowhead harvest is taken during the spring hunt. However, with larger quotas in recent years, it is common for a substantial fraction of the annual Barrow quota to remain available for the fall hunt (see Table 7 of the IHA application). The communities of Nuiqsut and Kaktovik participate only in the fall bowhead harvest. The fall migration of bowhead whales that summer in the eastern Beaufort Sea typically begins in late August or September. Fall migration into Alaskan waters is primarily during September and October. However, in recent years a small number of bowheads have been seen or heard offshore from the Prudhoe Bay region during the last week of August (Treacy, 1993; LGL and Greenridge, 1996; Greene, 1997; Greene *et al.*, 1999; Blackwell *et al.*, 2004).

TABLE 8—NUMBER OF BOWHEAD WHALE LANDING BY YEAR AT BARROW, CROSS ISLAND (NUIQSUT), AND KAKTOVIK, 1993 TO 2008. BARROW NUMBERS INCLUDE THE TOTAL NUMBER OF WHALES LANDED FOR THE YEAR FOLLOWED BY THE NUMBERS LANDED DURING THE FALL HUNT IN PARENTHESES. CROSS ISLAND (NUIQSUT) AND KAKTOVIK LANDINGS ARE IN AUTUMN

Year	Point Hope	Wainwright	Barrow	Cross Island	Kaktovik
1993	2	5	23 (7)	3	3
1994	5	4	16 (1)	0	3
1995	1	5	19 (11)	4	4
1996	3	3	24 (19)	2	1
1997	4	3	30 (21)	3	4
1998	3	3	25 (16)	4	3
1999	2	5	24 (6)	3	3
2000	3	5	18 (13)	4	3
2001	4	6	27 (7)	3	4
2002	0	1	22 (17)	4	3
2003	4	5	16 (6)	4	3
2004	3	4	21 (14)	3	3
2005	7	4	29 (13)	1	3
2006	0	2	22 (19)	4	3
2007	3	4	20 (7)	3	3
2008	2	2	21 (12)	4	3

Sources: USDI/BLM and references therein; Burns *et al.*, 1993; Koski *et al.*, 2005; Suydam *et al.*, 2004, 2005, 2006, 2007, 2008, and 2009.

The spring hunt at Barrow occurs after leads open due to the deterioration of pack ice; the spring hunt typically occurs from early April until the first week of June. The location of the fall subsistence hunt depends on ice conditions and (in some years) industrial activities that influence the bowheads as they move west (Brower, 1996). In the fall, subsistence hunters use aluminum or fiberglass boats with outboards. Hunters prefer to take bowheads close to shore to avoid a long tow during which the meat can spoil, but Braund and Moorehead (1995) report that crews may (rarely) pursue whales as far as 80 km (49.7 mi). The fall hunts begin in late August or early September in Kaktovik and at Cross

Island. At Barrow the fall hunt usually begins in mid-September, and mainly occurs in the waters east and northeast of Point Barrow in the Chukchi Sea (Suydam *et al.*, 2008). The whales have usually left the Beaufort Sea by late October (Treacy, 2002a, b).

The scheduling of this seismic survey has been discussed with representatives of those concerned with the subsistence bowhead hunt, most notably the AEWC, the Barrow Whaling Captains' Association, and the North Slope Borough (NSB) Department of Wildlife Management. The timing of the proposed seismic survey in early to mid-August will affect neither the spring nor the fall bowhead hunt. The Healy is planning to change crew after

the completion of the seismic survey through Barrow via helicopter or boat. That crew change is scheduled for approximately September 4 to 5, 2010, well before the fall bowhead whaling which typically begins late September or early October. All of the proposed geophysical activities will occur offshore between 71° and 84° North latitude well north of Beaufort Sea whaling activities.

Beluga whales are available to subsistence hunters at Barrow in the spring when pack-ice conditions deteriorate and leads open up. Belugas may remain in the area through June and sometimes into July and August in ice-free waters. Hunters usually wait until after the spring bowhead whale

hunt is finished before turning their attention to hunting belugas. The average annual harvest of beluga whales taken by Barrow from 1962 to 1982 was five (MMS, 1996). The Alaska Beluga Whale Committee recorded that 23 beluga whales had been harvested by Barrow hunters from 1987 to 2002, ranging from zero in 1987, 1988 and 1995 to the high of eight in 1997 (Fuller and George, 1997; Alaska Beluga Whale Committee, 2002 in USDI/BLM, 2005). The proposed seismic survey is unlikely to overlap with the beluga harvest, and the survey initiates well outside the area where impacts to beluga hunting by Barrow villagers could occur.

Ringed seals are hunted mainly from October through June. Hunting for these smaller mammals is concentrated during winter because bowhead whales, bearded seals, and caribou are available through other seasons. In winter, leads and cracks in the ice off points of land and along barrier islands are used for hunting ringed seals. The average annual ringed seal harvest by the community of Barrow from the 1960s through much of the 1980s has been estimated as 394 (see Table 8 of the IHA application). More recently Bacon *et al.* (2009) estimated that 586, 287, and 413 ringed seals were harvest by villagers at Barrow in 2000, 2001, and 2003, respectively. Although ringed seals are available year-round, the seismic survey will not occur during the primary period when these seals are typically harvested. Also, the seismic survey will be largely in offshore waters where the activities will not influence ringed seals in the nearshore areas where they are hunted.

The spotted seal subsistence hunt peaks in July and August, as indicated by data from 1987 to 1990, but involves few animals. Spotted seals typically migrate south by October to overwinter in the Bering Sea, Admiralty Bay, less than 60 km (37.3 mi) to the east of Barrow, is a location where spotted seals are harvested. Spotted seals are also occasionally hunted in the area off Point Barrow and along the barrier islands of Elson Lagoon to the east (USDI/BLM, 2005). The average annual spotted seal harvest by the community of Barrow from 1987 to 1990 was one animal (Braund *et al.*, 1993; see Table 7 of the IHA application). More recently however, Bacon *et al.* (2009) estimated that 32, 7, and 12 spotted seals were harvested by villagers at Barrow in 2000, 2001, and 2003, respectively. Spotted seals become less abundant at Nuiqsut and Kaktovik and few if any spotted seal are harvested at these villages. The seismic survey will commence at least 115 km (71.5 mi)

offshore from the preferred nearshore harvest area of these seals.

Bearded seals, although not favored for their meat, are important to subsistence activities in Barrow because of their skins. Six to nine bearded seal hides are used by whalers to cover each of the skin-covered boats traditionally used for spring whaling. Because of their valuable hides and large size, bearded seals are specifically sought. Bearded seals are harvested during the summer months in the Beaufort Sea (USDI/BLM, 2005). The animals inhabit the environment around the ice floes in the drifting ice pack, so hunting usually occurs from boats in the drift ice. Braund *et al.* (1993) estimated that 174 bearded seals were harvested annually at Barrow from 1987 to 1990 (see Table 8 of the IHA application). More recently Bacon *et al.* (2009) estimated that 728, 327, and 776 bearded seals were harvested by villagers at Barrow in 2000, 2001, and 2003, respectively. Braund *et al.* (1993) mapped the majority of bearded seal harvest sites from 1987 to 1990 as being within approximately 24 km (14.9 mi) of Point Barrow, well inshore of the proposed survey which is to start approximately 115 km (71.5 mi) offshore and terminate greater than 200 km (124.3 mi) offshore. The average annual take of bearded seals by the Barrow community from 1987 to 1990 was 174 (see Table 8 of the IHA application).

TABLE 9—AVERAGE ANNUAL TAKE OF MARINE MAMMALS OTHER THAN BOWHEAD WHALES HARVEST BY THE COMMUNITY OF BARROW (COMPILED BY LGL ALASKA RESEARCH ASSOCIATES, 2004)

Beluga whales	Ringed seals	Bearded seals	Spotted seals
**5	*394	*174	*1

* Average annual harvest for years 1987 to 1990 (Braund *et al.*, 1993).

** Average annual harvest for years 1962 to 1982 (MMS, 1996).

Plan of Cooperation

The USGS has communicated with community authorities and residents of Barrow to foster understanding of the proposed survey. There are elements of the proposed survey, intrinsic to the project that significantly limit the potential conflict with subsistence users. Operations will be conducted during early August before bowhead whale hunting typically occurs off Barrow and approximately 108 km (67.1 mi) offshore, farther offshore than traditional subsistence hunting grounds. USGS continues to work with the

people of Barrow to identify and avoid areas of potential conflict.

- The USGS initiated contact with NSB scientists and the chair of the AEW in mid-December, 2010 via an emailed description of the proposed survey that included components intended to minimize potential subsistence conflict.

- Invitations were extended December 31, 2009 to members of the NSB, AEW, and North Slope Communities to attend a teleconference arranged for January 11, 2010. The teleconference served as a venue to promote understanding of the project and discuss shareholder concerns. Participants in the teleconference included Harry Brower, chair of the AEW, and NSB wildlife biologist Dr. Robert Suydam.

- To further promote cooperation between the project researchers and the community, Dr. Deborah Hutchinson with USGS presented the proposed survey at a meeting of the AEW in Barrow on February 11, 2010. Survey plans were explained to local hunters and whaling captains, including NSB Department of Wildlife Management biologists, Craig George and Dr. Robert Suydam. Dr. Hutchinson consulted with stakeholders about their concerns and discussed the aspects of the survey designed to mitigate impacts.

- Dr. Deborah Hutchinson of the USGS emailed a summary of the topics discussed during the teleconference and the AEW meeting in Barrow to representatives of the NSB, AEW, and North Slope communities. These included:

- Surveying within U.S. waters is scheduled early (approximately August 11 to 19) to avoid conflict with hunters.

- The EA and IHA application have been distributed as early as possible to NSB and AEW.

- A community observer will be present aboard the *Healy* during the project.

- Mitigation of the one crew transfer near Barrow in early September will be arranged—probably through Barrow Volunteer Search and Rescue.

- Representatives of the USGS attended the Arctic Open-water Meeting in Anchorage, March 22 to 24, 2010.

- Dr. Deborah Hutchinson presented information regarding the proposed survey to the public during the Open-water meeting.

- Dr. Jonathan Childs and Dr. Deborah Hutchinson also met with stakeholders and agency representatives while at the meeting.

Subsequent meetings with whaling captains, other community representatives, the AEW, NSB, and

any other parties to the plan will be held if necessary to coordinate the planned seismic survey operation with subsistence hunting activity. The USGS has informed the chairman of the Alaska Eskimo Whaling Committee (AEWC), Harry Brower, Jr., of its survey plan.

As noted above and in the IHA application, in the unlikely event that subsistence hunting or fishing is occurring within 5 km (3 mi) of the project vessel tracklines, or where potential impacts could occur, the airgun operations will be suspended until the vessel is greater than 5 km away and otherwise not interfering with subsistence activities.

Endangered Species Act (ESA)

On May 21, 2010, USGS initiated informal consultation, under Section 7 of the ESA, with the NMFS, Office of Protected Resources, Endangered Species Division, on this seismic survey. Based on the information provided by USGS, NMFS concurred with their determination that the activities conducted during the proposed seismic survey are not likely to adversely affect endangered whales in the study area. No designated critical habitat occurs within the action area for this experiment, therefore, no critical habitat will be affected by the proposed

bathymetric and seismic surveys and other associated activities.

National Environmental Policy Act (NEPA)

USGS provided NMFS an Environmental Assessment (EA) analyzing the direct, indirect and cumulative environmental impacts of the proposed specified activities on marine mammals including those listed as threatened or endangered under the ESA. The EA, prepared by LGL Environmental Research Associated (LGL) on behalf of USGS, is titled "Environmental Assessment of a Marine Geophysical Survey of Parts of the Arctic Ocean, August–September 2010 (EA)". NMFS has adopted the USGS's EA and issued a Finding of No Significant Impact (FONSI) for the issuance of the IHA.

Determinations

NMFS has determined that the impact of conducting the specific marine seismic survey activities described in this notice and the IHA request in the specific geographic region within the U.S. EEZ and within the Arctic Ocean may result, at worst, in a temporary modification in behavior (Level B harassment) of small numbers of marine mammals. No take by injury (Level A

harassment), serious injury, or mortality is anticipated, and take by harassment will be at the lowest level practicable due to incorporation of the mitigation and monitoring measures mentioned previously in this document. Further, this activity is expected to result in a negligible impact on the affected species or stocks of marine mammals. NMFS has determined that this proposed activity will not have an unmitigable impact on the availability of the affected species or stock of marine mammals for subsistence uses. USGS will coordinate with local communities on implementation of the Plan of Cooperation.

As a result of these determinations, NMFS issued an IHA to USGS for conducting a marine seismic survey in the Arctic Ocean from August to September 2010, including the previously mentioned mitigation, monitoring, and reporting requirements. The duration of the IHA does not exceed one year from the date of its issuance.

Dated: September 22, 2010.

James H. Lecky,

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

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