upon written request or by appointment (See **SUPPLEMENTARY INFORMATION**).

FOR FURTHER INFORMATION CONTACT: Ruth Johnson or Jennifer Jefferies, (301)713–2289.

SUPPLEMENTARY INFORMATION: On February 10, 2005, notice was published in the **Federal Register** (70 FR 7082) that a request for a commercial/educational photography permit to take by harassment various cetacean and pinniped species had been submitted by the above-named individual. The requested permit has been issued under the authority of the Marine Mammal Protection Act of 1972, as amended (16 U.S.C. 1361 *et seq.*).

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

Documents may be reviewed in the following locations:

Permits, Conservation and Education Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)713–2289; fax (301)427–2521;

Assistant Regional Administrator for Protected Resources, Northwest Region, NMFS, 7600 Sand Point Way NE, BIN C15700, Bldg. 1, Seattle, WA 98115–0700; phone (206)526–6150; fax (206)526–6426;

Assistant Regional Administrator for Protected Resources, Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802–1668; phone (907)586–7235; fax (907)586–7012;

Assistant Regional Administrator for Protected Resources, Southwest Region, NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, CA 90802–4213; phone (562)980–4020; fax (562)980–4027;

Assistant Regional Administrator for Protected Resources, Pacific Islands Regional Office, NMFS, 1601 Kapiolani Blvd., Suite 1110, Honolulu, HI 96814–4700; phone (808)973–2935; fax (808)973–2941;

Assistant Regional Administrator for Protected Resources, Northeast Region, NMFS, One Blackburn Drive, Gloucester, MA 01930–2298; phone (978)281–9328; fax (987)281–9394; and

Assistant Regional Administrator for Protected Resources, Southeast Region, NMFS, 263 13th Avenue South, St. Petersburg, FL 33701, phone (727)824–5312; fax (727)824–5309.

Dated: May 4, 2005.

Stephen L. Leathery,

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

[FR Doc. 05–9330 Filed 5–9–05; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[I.D. 040505A]

Small Takes of Marine Mammals Incidental to Specified Activities; Marine Geophysical Survey Across the Arctic Ocean

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

ACTION: Notice of receipt of application and proposed incidental take authorization; request for comments.

SUMMARY: NMFS has received an application from the University of Alaska Fairbanks (UAF) for an Incidental Harassment Authorization (IHA) to take small numbers of marine mammals, by harassment, incidental to conducting a marine seismic survey across the Arctic Ocean from northern Alaska to Svalbard. Under the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an authorization to UAF to incidentally take, by harassment, small numbers of several species of cetaceans and pinnipeds from August 5 to September 30, 2005, during the seismic survey.

DATES: Comments and information must be received no later than June 9, 2005.

ADDRESSES: Comments on the application should be addressed to Steve Leathery, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3225, or by telephoning the contact listed here. The mailbox address for providing email comments is *PR1.040505A@noaa.gov*. NMFS is not responsible for e-mail comments sent to addresses other than the one provided here. Comments sent via e-mail, including all attachments, must not exceed a 10–megabyte file size. A copy of the application containing a list of the references used in this document may be obtained by writing to this address or by telephoning the contact listed here and is also available at: *http://www.nmfs.noaa.gov/prot__res/PR2/Small__Take/smalltake__info.htm#applications*. Documents cited in this notice may be viewed, by appointment, during regular business hours, at the aforementioned address.

FOR FURTHER INFORMATION CONTACT: Jolie Harrison, Office of Protected Resources, NMFS, (301) 713–2289, ext 166.

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 to allow, upon request, the incidental, but not intentional, taking of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

Authorization may 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 that the permissible methods of taking and requirements pertaining to the 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 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].

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 on 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 issuance of the authorization.

Summary of Request

On March 30, 2005, NMFS received an application from UAF for the taking, by harassment, of several species of marine mammals incidental to conducting, with research funding from the National Science Foundation (NSF) and the Norwegian Petroleum Directorate (NPD), a marine seismic survey across the Arctic Ocean from northern Alaska to Svalbard during the period 5 August to 30 September 2005. The purpose of the proposed seismic study is to collect seismic reflection and refraction data that reveal the structure and stratigraphy of the upper crust of the Arctic Ocean. These data will assist in the determination of the history of ridges and plateaus that subdivide the Amerasian basin in the Arctic Ocean. Past studies have mapped the bottom of the Arctic Ocean, but data are needed to describe the boundaries and connections between the ridges and plateaus in the Amerasian basin and to study the stratigraphy of the smaller basins. This information will assist in preparing for future scientific drilling that is crucial to reconstructing the tectonic, magmatic, and paleoclimatic history of the Amerasian basin.

Description of the Activity

The geophysical survey will involve the United States Coast Guard (USCG) cutter *Healy*. The *Healy* will rendezvous with the Swedish icebreaker *Oden* near Alpha Ridge. The *Oden* will be working on a separate project, conducting an oceanographic section across the Arctic Ocean basin and will coordinate its timing to meet the *Healy*. The Oden will cut a path through the ice as necessary, leading the *Healy* for the remainder of the trans-ocean track past the North Pole and then on towards Svalbard. The two icebreakers working in tandem will optimize seismic data collection and safety through the heaviest multi-year ice.

The source vessel, the USCG icebreaker *Healy*, will use a portable Multi-Channel Seismic (MCS) system from the University of Bergen to conduct the seismic survey. The Healy will tow two different airgun configurations. The primary energy source will be two Generator guns (G. guns), each with a discharge volume of 250 in^3 for a total volume of 500 in^3. The secondary energy source will be a single Bolt airgun of 1200 in^3 that will be used for deeper penetration over three ridges (the Alpha, Mendeleev, and Gakkel ridges).

The *Healy* will also tow a hydrophone streamer 100–150 m (328–492 ft) behind the ship, depending on ice conditions. The hydrophone streamer will be up to 300 m (984 ft) long. As the airguns are towed along the survey lines, the receiving system will receive the returning acoustic signals. In addition to the airguns, a multi-beam sonar and sub-bottom profiler will be used during the seismic profiling and continuously when underway.

The program will consist of a total of approximately 4060 km (2192 nautical miles (nm)) of surveys, not including transits when the airguns are not operating, plus scientific coring at nine locations. The seismic survey will commence >40 km (22 nm) north of Barrow, Alaska, and the seismic activities will be completed northwest of Svalbard, in Norwegian territorial waters. Water depths within the study area are 20 4000 m (66–13123 ft). Little more than 1 percent of the survey (approximately 48 km (26 nm)) will occur in water depths <100 m (328 ft), 5 percent of the survey (approximately 192 km (104 nm)) will be conducted in water 100 1000 m (328–3280 ft) deep, and most (94 percent) of the survey (approximately 3820 km (2063 nm)) will occur in water ≤1000 m (3280 ft). Additional seismic operations will be associated with airgun testing, start up, and repeat coverage of any areas where initial data quality is sub-standard.

Along with the airgun operations, additional acoustical systems will be operated during much of, or the entire, cruise. The ocean floor will be mapped with a multi-beam sonar, and a sub-bottom profiler will be used. These two systems are commonly operated simultaneously with an airgun system. An acoustic Doppler current profiler will also be used through the course of the project. A 12–kHz pinger will be used during the sea-bottom coring operations to monitor the depth of the corer relative to the ocean floor. A detailed description of the acoustic sources proposed for use during this survey can be found in the UAF application, which is available at: *http://www.nmfs.noaa.gov/prot__res/PR1/Small__Take/smalltake__info.htm#applications*.

The coring operations constitute a separate project, which will be conducted in conjunction with the seismic study from the Healy. Seismic operations will be suspended while the USCG Healy is on site for coring at each of nine locations. Depending on water depth and the number of cores to be collected, the Healy may be at each site for between 8 and 36 hours.

Vessel Specifications

The *Healy* has a length of 128 m (420 ft), a beam of 25 m (82 ft), and a full load draft of 8.9 m (29.2 ft). The *Healy* is a USCG icebreaker, capable of traveling at 5.6 km/h (3 knots) through 1.4 m (4.6 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, 3–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 operation speed during seismic acquisition is expected to be approximately 6.5 km/h (3.5 knots). When not towing seismic survey gear or breaking ice, the *Healy* cruises at 22 km/h (12 knots) and has a maximum speed of 31.5 km/h (17 knots). She has a normal operating range of about 29,650 km (16,000 nm) at 23.2 km/hr (12.5 knots).

The *Healy* will also serve as the platform from which vessel-based marine mammal observers will watch for marine mammals before and during airgun operations. The characteristics of the *Healy* that make it suitable for visual monitoring are described in the monitoring section.

Airgun Description and Safety Radii

The University of Bergen's portable MCS system will be installed on the *Healy* for this cruise. The *Healy* will tow either two Sodera 250–in^3 G. guns (for a total discharge volume of 500 in^3) or a single 1200–in^3 Bolt airgun, along with a streamer containing hydrophones, along predetermined lines. Seismic pulses will be emitted at intervals of 20 seconds (s) and recorded at a 2 millisecond (ms) sampling rate. The 20 s spacing corresponds to a shot interval of approximately 36 m (118 ft) at the typical cruise speed.

The two-G. gun-cluster configuration will be towed below a depressor bird at a depth between 7 and 20 m (23 and 66 ft), as close to the *Healy*'s stern as possible to minimize ice interference (preferred depth is 8 to 10 m (26 to 29 ft)). The two airguns will be towed 1 m (3.3 ft) apart, separated by a spreader bar. The G. guns have a zero to peak (peak) source output of 236 dB re 1 microPascal-m (6.5 bar-m) and a peak-to-peak (pk-pk) level of 241 dB (11.7 bar-m). The dominant frequency components of these airguns are in the range of 0–150 Hz. For a one-gun source, the nominal source level represents the actual level that would be found about 1 m (3.3 ft) from the airgun.

Actual levels experienced by any marine organism more than 1 m (3.3 ft) from the airguns will be significantly lower.

The single Bolt airgun will be towed below a depressor bird at a depth of 10 m (29 ft). This airgun has peak source output of 234 dB re 1 microPascal-m (5 bar-m) and a pk-pk level of 241 dB (11.7 bar-m). The dominant frequency components of these airguns are in the range of 8–40 Hz. Indicated source outputs are for sources at 5 m (16 ft) and for a filter bandwidth of approximately 0–250 Hz.

Received sound levels were modeled by L-DEO for single 1200 in³ Bolt airgun and for the one and two 250 in*3* G. guns in relation to distance and direction from the gun. This publically available model does not allow for bottom interactions, and, thus, is most directly applicable to deep water. For deep water, where most of the present project is to occur, the L-DEO model has been shown to be precautionary, i.e., it tends to overestimate radii for 190, 180, etc., dB re 1 µPa rms (Tolstoy *et al.* 2004a,b). Based on the models, table 1 shows the distances from the planned sources where sound levels of 190, 180, and 160 dB re 1 microPa root-mean squared (rms) are predicted to be received. The rms pressure is an average over the pulse duration. This is the measure commonly used in studies of marine mammal reactions to airgun sounds, and in NMFS guidelines concerning levels above which ''taking'' might occur. The rms level of a seismic pulse is typically about 10 dB less than its peak level (Greene 1997; McCauley *et al.* 1998, 2000a).

TABLE 1. ESTIMATED DISTANCES TO WHICH SOUND LEVELS ≥190, 180, AND 160 DB RE 1 MICROPA (RMS) MIGHT BE RECEIVED FROM THE 250 IN³ G. GUN(S) AND 1200 IN3 BOLT AIRGUN THAT WILL BE USED DURING THE SEISMIC SURVEY ACROSS THE ARCTIC OCEAN DURING 2005. THE SOUND RADII USED DURING THE SURVEY WILL DEPEND ON WATER DEPTH (SEE TEXT). DISTANCES ARE BASED ON MODEL RESULTS PROVIDED BY THE LAMONT-DOHERTY EARTH OBSERVATORY OF COLUMBIA UNIVERSITY.

Seismic Source Volume	Water depth	Estimated Distances at Received Levels (m)		
		190 dB (safety criterion for pinnipeds)	180 dB (safety criterion for cetaceans)	160 dB (assumed onset of behavioral harassment)
250 in³G. gun	>1000 m	17	52	500
	100-1000 m	26	78	750
	<100 m	213	385	1364
500 in³2 G. guns	>1000 m	100	325	3300
	100-1000 m	150	500	5000
	<100 m	1500	2400	9700
1200 in³2 Bolt aigun	>1000 m	25	50	560
	100-1000 m	38	75	840
	<100 m	313	370	1527

For the two-G. gun source, the highest sound level measurable at any location in the water would be slightly less than the nominal source level because the actual source is a distributed source rather than a point source. However, the two guns would be only 1 m (3.3 ft) apart, so the non-point-source effect would be slight. For the single Bolt airgun, the source level represents the actual level that would be found about 1 m from the energy source. Actual levels experienced by any organism more than 1 m from either of the sources will be significantly lower.

The rms received levels that are used by NMFS 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 to describe airgun sources, i.e., peak or pk-pk decibels, are always higher than the rms decibels referred to in much of the biological literature. A measured received level of 160 decibels rms in the far field would typically correspond to a peak measurement of about 170 to 172 dB, and to a peak-to-peak measurement of about 176 to 178 decibels, as measured for the same pulse received at the same location (Greene 1997; McCauley et al. 1998, 2000a). The precise difference between rms and peak or pk-pk 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 pk-pk level for an airgun-type source.

The depth at which the sound source is towed has a major impact on the maximum near-field output, and on the shape of its frequency spectrum. In this case, the source is expected to be towed at relatively deep depths of 7 to 20 m (23 to 66 ft).

Empirical data concerning the 190-, 180-, and 160–dB (rms) isopleths in deep and shallow water have been acquired for various airgun configurations based on measurements during the acoustic verification study conducted by L-DEO in the northern Gulf of Mexico from 27 May to 3 June 2003 (Tolstoy *et al*., 2004a, b). Those data demonstrated that L-DEO's model tends to overestimate the isopleth distances applied in deep water. During that study, empirical data were not obtained for either the 1200–in3 Bolt airgun or the G. guns that will be used during this survey. Although the results were limited, the calibration-study results showed that radii around the airguns where the received level would be 180 dB re 1 microPa (rms), the safety zone radius NMFS uses for cetaceans, (NMFS 2000), vary with water depth. Similar depth-related variation is likely in the 190 dB distances used for pinnipeds. Although sea turtle sightings are highly unlikely, the 180–dB distance will also be used as the safety radius for sea turtles, as required by NMFS in another recent seismic project (Smultea *et al*., 2005). The safety zones are used to trigger mitigation measures, which are described below.

The L-DEO model does not allow for bottom interactions, and thus is most directly applicable to deep water and to relatively short ranges. In intermediate-depth water a precautionary 1.5x factor will be applied to the values predicted by L-DEO's model. In shallow water, larger precautionary factors derived from the empirical shallow-water measurements will be applied. The proposed study area will occur mainly in water 1000 to 4000 m (3280 to 13123 ft) deep, with only approximately 1 percent of the survey lines in shallow (<100 m (328 ft)) water and 5 percent of the survey lines in intermediate water depths (100 1000 m (328–3280 ft)).

The empirical data indicate that, for *deep water* (>1000 m (3280 ft)), the L-DEO model tends to overestimate the received sound levels at a given distance (Tolstoy *et al*., 2004a,b). However, to be precautionary pending acquisition of additional empirical data, UAF has proposed using safety radii during airgun operations in deep water that correspond to the values predicted by L-DEO's model for deep water (Table 1). In deep water, the estimated 190 and 180 dB radii for two 250–in3 G. guns are 100 and 325 m (328 and 1067 ft), respectively. Those for one 1200–in^3 Bolt airgun are 25 and 50 m (82 and 164 ft), respectively.

Empirical measurements were not conducted for intermediate depths (100 1000 m (328–3280 ft)). On the expectation that results would be somewhere between those from shallow and deep water, UAF has applied a 1.5x correction factor to the estimates provided by the model for deep water situations. This is the same factor that has been applied to the model estimates during L-DEO operations in intermediate-depth water from 2003 through early 2005. The estimated 190– and 180–dB radii in intermediate-depth water are 150 m (490 ft) and 500 m (1640 ft), respectively, for the two G. gun system and 38 and 75 m (125 and 246 ft), respectively, for the single Bolt airgun (Table 1).

Empirical measurements were not made for the sources that will be employed during the proposed survey operating in shallow water (<100 m (328 ft)). The empirical data on operations of two 105 in3 GI guns in shallow water showed that modeled values underestimated actual levels in shallow water at corresponding distances of 0.5 to 1.5 km (0.3 to 0.5 nm) by a factor of approximately 3x (Tolstoy *et al*., 2004b). Sound level measurements for the 2 GI guns were not available for distances <0.5 km (0.3 nm) from the source. The radii estimated here for two G. guns operating in shallow water are derived from L-DEO's deep water estimates, with the same adjustments for depth-related differences in sound propagation used for 2 GI guns in earlier applications (and approximately the same factors as used for L-DEO's 10–airgun array). Similarly, the factors for the single airguns are the same as those for a single GI gun in earlier applications. Thus, the estimated 190- and 180–dB radii in shallow water are 1500 and 2400 m (4921 and 7874 ft), respectively, for the two G. guns (Table 1). The corresponding radii for the single G. gun in shallow water are estimated to be 213 and 385 m (699 and 1263 ft), respectively. The sound radii for the single Bolt airgun in shallow water are estimated to be 313 m (1027 ft) for 190 dB and 370 m (1214 ft) for 180 dB.

Characteristics of Airgun Pulses

Discussion of the characteristics of airgun pulses has been provided in the application and in previous **Federal Register** notices (see 69 FR 31792 (June 7, 2004) or 69 FR 34996 (June 23, 2004)). Reviewers are referred to those documents for additional information.

Description of Habitat and Marine Mammals Affected by the Activity

A detailed description of the *Healy*'s track from north of Barrow, through the Arctic ocean to northwest of Svalbard and the associated marine mammals can be found in the UAF application and a number of documents referenced in the UAF application. A total of 17 cetacean species and 10 pinniped species may occur in the proposed study area. The marine mammals that occur in the proposed survey area belong to four taxonomic groups: odontocetes (toothed cetaceans, such as dolphins and sperm whales), mysticetes (baleen whales), pinnipeds (seals, sea lions, and walrus), and fissipeds (polar bear).

Odontocete whales include the sperm whale, northern bottlenose whale, beluga whale, narwhal, Atlantic white-beaked dolphin, Atlantic white-sided dolphin, killer whale, long-finned pilot whale, and harbor porpoise.

Mysticete whales include the North Atlantic right whale, bowhead whale, gray whale, humpback whale, minke whale, sei whale, fin whale, and blue whale.

Pinnipeds include the walrus, bearded seal, harbor seal, spotted seal, ringed seal, hooded seal, and harp seal.

The marine mammal species most likely to be encountered include four cetacean species (beluga whale, narwhal, gray whale, bowhead whale), five pinniped species (walrus, bearded seal, ringed seal, hooded seal, harp seal), and the polar bear. However, most of these will occur in low numbers and are most likely to be encountered within 100 km (54 n.mi) of shore. The most abundant marine mammal likely to be encountered throughout the cruise is the ringed seal. The most widely distributed marine mammals are expected to be the beluga, ringed seal, and polar bear.

About 13 additional cetacean species could occur in the project area, but are unlikely to be encountered along the proposed trackline. If encountered at all, those species would be found only near one end of the track, either near Svalbard or near Alaska. The following 12 species, if encountered at all, would be found close to Svalbard: sperm whale, northern bottlenose whale, long-finned pilot whale, Atlantic white-sided dolphin, Atlantic white-beaked dolphin, harbor porpoise, killer whale, North Atlantic right whale, humpback whale, minke whale, sei whale, fin whale, and blue whale. Two additional pinniped species, the harbor seal and spotted seal, are also unlikely to be encountered.

Although information on the walrus and polar bear are included here, they are managed by the U.S. Fish & Wildlife Service (USFWS) and are not the subject of this authorization. UAF will coordinate with the USFWS regarding the effects of project operations on walruses and polar bears.More detailed information on these species is contained in the UAF application (see **ADDRESSES**).

Potential Effects on Marine Mammals

The effects of noise on marine mammals are highly variable, and can be categorized as follows (based on Richardson *et al*., 1995):

(1) The noise may be too weak to be heard at the location of the animal (i.e., lower than the prevailing ambient noise level, the hearing threshold of the animal at relevant frequencies, or both);

(2) The noise may be audible but not strong enough to elicit any overt behavioral response;

(3) The noise may elicit reactions of variable conspicuousness and variable relevance to the well being of the marine mammal; these can range from temporary alert responses to active avoidance reactions such as vacating an area at least until the noise event ceases;

(4) Upon repeated exposure, a marine mammal may exhibit diminishing responsiveness (habituation), or disturbance effects may persist; the latter is most likely with sounds that are highly variable in characteristics, infrequent and unpredictable in occurrence, and associated with situations that a marine mammal perceives as a threat;

(5) Any anthropogenic noise that is strong enough to be heard has the potential to reduce (mask) the ability of a marine mammal to hear natural sounds at similar frequencies, including calls from conspecifics, and underwater environmental sounds such as surf noise;

(6) If mammals remain in an area because it is important for feeding, breeding or some other biologically

important purpose even though there is chronic exposure to noise, it is possible that there could be noise-induced physiological stress; this might in turn have negative effects on the well-being or reproduction of the animals involved; and

(7) Very strong sounds have the potential to cause temporary or permanent reduction in hearing sensitivity. In terrestrial mammals, and presumably marine mammals, received sound levels must far exceed the animal's hearing threshold for there to be any temporary threshold shift (TTS) in its hearing ability. For transient sounds, the sound level necessary to cause TTS is inversely related to the duration of the sound. Received sound levels must be even higher for there to be risk of permanent hearing impairment. In addition, intense acoustic or explosive events may cause trauma to tissues associated with organs vital for hearing, sound production, respiration and other functions. This trauma may include minor to severe hemorrhage.

Effects of Seismic Surveys on Marine Mammals

The UAF application provides the following information on what is known about the effects on marine mammals of the types of seismic operations planned by UAF. The types of effects considered in here are (1) tolerance, (2) masking of natural sounds, (3) behavioral disturbance, and (4) potential hearing impairment and other non-auditory physical effects (Richardson et al., 1995). Because the airgun sources planned for use during the present project involve only one or two airguns, the effects are anticipated to be considerably less than would be the case with a large array. UAF and NMFS believe it is very unlikely that there would be any cases of temporary or permanent hearing impairment, or non-auditory physical effects. Also, behavioral disturbance is expected to be limited to animals that are at distances less than 3300 m (10827 ft) in deep water (94 percent of survey), 5000 m (16404 ft) in intermediate water depths (5 percent of survey), and 9700 m (31824 ft) in shallow water (1 percent of survey), where the received sound levels greater than160 dB are expected to be. This corresponds to the value NMFS uses for onset of Level B harassment due to impulse sounds. Additional discussion on effects on marine mammal species can be found in the UAF application.

Tolerance

Numerous studies (referenced in L-DEO, 2004) have shown that pulsed sounds from airguns are often readily detectable in the water at distances of many kilometers, but that marine mammals at distances more than a few kilometers from operating seismic vessels often show no apparent response. That is often true even in cases when the pulsed sounds must be readily audible to the animals based on measured received levels and the hearing sensitivity of that mammal group. However, most measurements of airgun sounds that have been reported concerned sounds from larger arrays of airguns, whose sounds would be detectable farther away than the ones that are planned to be used in the proposed survey. Although various baleen whales, toothed whales, and pinnipeds have been shown to react behaviorally to airgun pulses under some conditions, at other times all three types of mammals have shown no overt reactions. In general, pinnipeds and small odontocetes seem to be more tolerant of exposure to airgun pulses than are baleen whales. Given the low-energy airgun sources planned for use in this proposed project, marine mammals would be expected to tolerate being closer to these sources than would be the case for a larger airgun source typical of most seismic surveys.

Masking

Masking effects of pulsed sounds (even from large arrays of airguns) on marine mammal calls and other natural sounds are expected to be limited, although there are very few specific data of relevance. Some whales are known to continue calling in the presence of seismic pulses. Their calls can be heard between the seismic pulses (e.g., Richardson *et al.*, 1986; McDonald *et al.*, 1995; Greene *et al.*, 1999; Nieukirk *et al.*, 2004). Although there has been one report that sperm whales cease calling when exposed to pulses from a very distant seismic ship (Bowles *et al.*, 1994), a more recent study reports that sperm whales off northern Norway continued calling in the presence of seismic pulses (Madsen *et al.*, 2002). That has also been shown during recent work in the Gulf of Mexico (Tyack *et al.* 2003). Given that the airgun sources planned for use here involve only 1 or 2 airguns, there is even less potential for masking of baleen or sperm whale calls during the present study than in most seismic surveys. Masking effects of seismic pulses are expected to be negligible in the case of the odontocete cetaceans, given the intermittent nature of seismic pulses and the relatively low source level of the airgun configurations to be used here. Also, the sounds important to odontocetes are predominantly at much higher frequencies than are airgun sounds and would not be masked by the airguns.

Most of the energy in the sound pulses emitted by airguns is at low frequencies, with strongest spectrum levels below 200 Hz and considerably lower spectrum levels above 1000 Hz. These low frequencies are mainly used by mysticetes, but generally not by odontocetes or pinnipeds. An industrial sound source will reduce the effective communication or echolocation distance only if its frequency is close to that of the marine mammal's signal. If little or no overlap occurs between the frequencies of the industrial noise and the marine mammals, as in the case of many marine mammals relative to airgun sounds, communication and echolocation are not expected to be disrupted. Furthermore, the discontinuous nature of seismic pulses makes significant masking effects unlikely even for mysticetes.

A few cetaceans are known to increase the source levels of their calls in the presence of elevated sound levels, or possibly to shift their peak frequencies in response to strong sound signals (Dahlheim, 1987; Au, 1993; Lesage *et al.*, 1999; Terhune, 1999; as reviewed in Richardson *et al.*, 1995). These studies involved exposure to other types of anthropogenic sounds, not seismic pulses, and it is not known whether these types of responses ever occur upon exposure to seismic sounds. If so, these adaptations, along with directional hearing, pre-adaptation to tolerate some masking by natural sounds (Richardson et al., 1995) and the relatively low-power acoustic sources being used in this survey, would all reduce the possible adverse impacts of masking marine mammal vocalizations.

Behavioral Disturbance by Seismic Surveys

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. Not all behavioral disturbances rise to the level of Level B Harassment, which requires a disruption of behavioral patterns of biological importance. Exposure to sound alone may not constitute harassment or ''taking'' (NMFS 2001, p. 9293). Behavioral reactions of marine mammals to sound are difficult to predict. Reactions to sound, if any, depend on species, individual variation, state of maturity, experience, current activity, reproductive state, time of day, season, and many other factors. If a marine mammal does react to an underwater sound by changing its behavior or moving a small distance, the impacts of the change may not rise to the level of a disruption of a behavioral pattern. However, if a sound source would displace a marine mammal from an important feeding or breeding area, such a disturbance may constitute Level B harassment under the MMPA. In addition, effects that might not constitute Level B harassment may still result in significant displacement of sensitive species, such as bowhead whales, thereby affecting subsistence needs. Given the many uncertainties in predicting the quantity and types of impacts of noise on marine mammals, NMFS estimates the number of marine mammals that may be present within a particular distance of industrial activities or exposed to a particular level of industrial sound and uses these numbers as a proxy. With the possible exception of beaked whales, NMFS believes that this is a conservative approach and likely overestimates the numbers of marine mammals that may experience a disruption of a behavioral pattern.

The sound exposure criteria used to estimate how many marine mammals might be harassed behaviorally by the seismic survey are based on behavioral observations during studies of several species. However, information is lacking for many other species. Detailed studies have been conducted on humpback, gray, and bowhead whales, and on ringed seals. Less detailed data are available for some other species of baleen whales, sperm whales, small toothed whales, and sea otters. Most of those studies have been on behavioral reactions to much larger airgun sources than the airgun configurations planned for use in the present project. Thus, effects are expected to be limited to considerably smaller distances and shorter periods of exposure in the present project than in most of the previous work concerning marine mammal reactions to airguns. Detailed information on potential disturbance effects on baleen whales, toothed whales, and pinnipeds can be found in the UAF application.

Hearing Impairment and Other Physical Effects

Temporary or permanent hearing impairment is a possibility when marine mammals are exposed to very strong sounds, but there has been no specific documentation of this for marine mammals exposed to airgun pulses. Based on current information, NMFS precautionarily sets impulsive sounds equal to or greater than 180 and 190 dB re 1 microPa (rms) as the exposure thresholds for onset of Level A harassment (injury) for cetaceans and pinnipeds, respectively (NMFS, 2000). Those criteria have been used for several years in setting the safety (shut-down) radii for seismic surveys. As discussed in the UAF application and summarized here,

1. The 180–dB criterion for cetaceans is probably quite precautionary, i.e., lower than necessary to avoid TTS let alone permanent auditory injury, at least for delphinids.

2. The minimum sound level necessary to cause permanent hearing impairment is higher, by a variable and generally unknown amount, than the level that induces barely-detectable TTS.

3. The level associated with the onset of TTS is often considered to be lower than levels that may cause permanent hearing damage.

Because the airgun sources planned for use during this project involve only 1 or 2 guns, and with the planned monitoring and mitigation measures, there is little likelihood that any marine mammals will be exposed to sounds sufficiently strong to cause even the mildest (and reversible) form of hearing impairment. Several aspects of the planned monitoring and mitigation measures for this project are designed to detect marine mammals occurring near the airgun(s), and multi-beam sonar, and to avoid exposing them to sound pulses that might (at least in theory) cause hearing impairment. In addition, many cetaceans are likely to show some avoidance of the small area with high received levels of airgun sound (see above). In those cases, the avoidance responses of the animals themselves will likely reduce or prevent any possibility of hearing impairment.

Non-auditory physical effects might also occur in marine mammals exposed to strong underwater pulsed sound. Possible types of non-auditory physiological effects or injuries that theoretically might occur in mammals close to a strong sound source include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. It is possible that some marine mammal species (i.e., beaked whales) may be especially susceptible to injury and/or stranding when exposed to strong pulsed sounds. However, as discussed below, there is no definitive evidence that any of these effects occur even in marine mammals that are in close proximity to large arrays of airguns. UAF and NMFS believe that it is highly unlikely that any of these non-auditory effects would occur during the proposed survey given the small size of the source, the brief duration of exposure of any given mammal, and the planned mitigation and monitoring measures. The following paragraphs discuss the possibility of TTS, permanent threshold shift (PTS), and non-auditory physical effects.

TTS

TTS is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter, 1985). When an animal experiences TTS, its hearing threshold rises and a sound must be stronger in order to be heard. TTS can last from minutes or hours to (in cases of strong TTS) days. Richardson *et al.* (1995) note that the magnitude of TTS depends on the level and duration of noise exposure, among other considerations. For sound exposures at or somewhat above the TTS threshold, hearing sensitivity recovers rapidly after exposure to the noise ends. Little data on pulsed sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals, and none of the published data concern TTS elicited by exposure to multiple pulses of sound.

For toothed whales exposed to single short pulses, the TTS threshold appears to be, at a first approximation, a function of the energy content of the pulse (Finneran *et al.*, 2002). Given the available data, the received level of a single seismic pulse might need to be approximately 210 dB re 1 microPa rms (approx. 221 226 dB pk pk) in order to produce brief, mild TTS. Exposure to several seismic pulses at received levels near 200 205 dB (rms) might result in slight TTS in a small odontocete, assuming the TTS threshold is at a function of the total received pulse energy (Finneran *et al.*, 2002). Seismic pulses with received levels of 200 205 dB or more are usually restricted to a zone of no more than 100 m (328 ft) around a seismic vessel operating a large array of airguns. Such sound levels would be limited to distances within a few meters of the single airgun planned for use during this project.

There are no data, direct or indirect, on levels or properties of sound that are required to induce TTS in any baleen whale. However, TTS is not expected to occur during this survey given that the airgun sources involve only 1 or 2 airguns, and the strong likelihood that baleen whales would avoid the approaching airgun(s), or vessel, before being exposed to levels high enough for there to be any possibility of TTS.

TTS thresholds for pinnipeds exposed to brief pulses (single or multiple) have not been measured, although exposures up to 183 dB re 1 microPa (rms) have been shown to be insufficient to induce TTS in captive California sea lions (Finneran *et al.*, 2003). However, studies for prolonged exposures show that some pinnipeds may incur TTS at somewhat lower received levels for prolonged exposures than do small odontocetes exposed for similar durations (Kastak *et al.*, 1999; Ketten *et al.*, 2001; Au *et al.*, 2000). More recent indications are that TTS onset in the most sensitive pinniped species studied (harbor seal) may occur at a similar sound exposure level as in odontocetes (Kastak *et al.* 2004).

A marine mammal within 100 m (≤328 ft) of a typical large array of operating airguns might be exposed to a few seismic pulses with levels of ≥205 dB, and possibly more pulses if the mammal moved with the seismic vessel. (As noted above, most cetacean species tend to avoid operating airguns, although not all individuals do so.) However, several of the considerations that are relevant in assessing the impact of typical seismic surveys with arrays of airguns are not directly applicable here:

(1) The planned airgun sources involve only 1 or 2 airguns, with correspondingly smaller radii within which received sound levels could exceed any particular level of concern.

(2) ''Ramping up'' (soft start) is standard operational protocol during startup of large airgun arrays in many jurisdictions. Ramping up involves starting the airguns in sequence, usually commencing with a single airgun and gradually adding additional airguns. This practice will be employed when the 2 G. guns are operated.

(3) Even with a large airgun array, it is unlikely that cetaceans would be exposed to airgun pulses at a sufficiently high level for a sufficiently long period to cause more than mild TTS, given the relative movement of the vessel and the marine mammal. In this project, the airgun sources are much less strong, so the area of influence and duration of exposure to strong pulses is much smaller, especially in deep and intermediate-depth water.

(4) With a large array of airguns, TTS would be most likely in any odontocetes that bow-ride or otherwise linger near the airguns. In the present project, the anticipated 180 dB distances in deep and intermediate-depth water are 325 and 500 m (1066 and 1640 ft), respectively, for the 2 G. gun system, and 50 and 75 m (164 and 246 ft), respectively, for the single Bolt airgun (Table 2). The waterline at the bow of the *Healy* will be approximately 123 m (403 ft) ahead of the airgun.

NMFS believes that, to avoid Level A harassment, cetaceans should not be exposed to pulsed underwater noise at received levels exceeding 180 dB re 1 microPa (rms). The corresponding limit for pinnipeds is 190 dB. The predicted 180- and 190–dB distances for the airgun arrays operated by UAF during this activity are summarized in Table 1 in this document.

It has also been shown that most whales tend to avoid ships and associated seismic operations. Thus, whales will likely not be exposed to such high levels of airgun sounds. Because of the slow ship speed, any whales close to the trackline could move away before the sounds become sufficiently strong for there to be any potential for hearing impairment. Therefore, there is little potential for whales being close enough to an array to experience TTS. In addition, ramping up multiple airguns in arrays has become standard operational protocol for many seismic operators and will occur when the 2 G. guns are operated.

PTS

When PTS occurs there is physical damage to the sound receptors in the ear. In some cases there can be total or partial deafness, while in other cases the animal has an impaired ability to hear sounds in specific frequency ranges. Although there is no specific evidence that exposure to pulses of airgun sounds can cause PTS in any marine mammals, even with the largest airgun arrays, physical damage to a mammal's hearing apparatus can potentially occur if it is exposed to sound impulses that have very high peak pressures, especially if they have very short rise times (time required for sound pulse to reach peak pressure from the baseline pressure). Such damage can result in a permanent decrease in functional sensitivity of the hearing system at some or all frequencies.

Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage in terrestrial mammals. However, very prolonged exposure to sound strong enough to elicit TTS, or shorter-term exposure to sound levels well above the TTS threshold, can cause PTS, at least in terrestrial mammals (Kryter, 1985). Relationships between TTS and PTS thresholds have not been studied in marine mammals but are assumed to be similar to those in humans and other terrestrial mammals, based on their similar anatomy and inner ear structures. The low-to-moderate levels of TTS that have been induced in captive odontocetes and pinnipeds during recent controlled studies of TTS have been confirmed to be temporary, with no measurable residual PTS (Kastak *et al.*, 1999; Schlundt *et al.*, 2000; Finneran *et al.*, 2002; Nachtigall *et al.*, 2003). In terrestrial mammals, the received sound level from a single non-impulsive sound exposure must be far above the TTS threshold for any risk of permanent hearing damage (Kryter, 1994; Richardson et al., 1995). For impulse sounds with very rapid rise times (e.g., those associated with explosions or gunfire), a received level not greatly in excess of the TTS threshold may start to elicit PTS. The rise times for airgun pulses are rapid, but less rapid than for explosions.

Some factors that contribute to onset of PTS are as follows: (1) exposure to single very intense noises, (2) repetitive exposure to intense sounds that individually cause TTS but not PTS, and (3) recurrent ear infections or (in captive animals) exposure to certain drugs.

Cavanagh (2000) has reviewed the thresholds used to define TTS and PTS. Based on his review and SACLANT (1998), it is reasonable to assume that PTS might occur at a received sound level 20 dB or more above that which induces mild TTS. However, for PTS to occur at a received level only 20 dB above the TTS threshold, it is probable that the animal would have to be exposed to the strong sound for an extended period.

Sound impulse duration, peak amplitude, rise time, and number of pulses are the main factors thought to determine the onset and extent of PTS. Based on existing data, Ketten (1994) has noted that the criteria for differentiating the sound pressure levels that result in PTS (or TTS) are location and species-specific. PTS effects may also be influenced strongly by the health of the receiver's ear.

Given that marine mammals are unlikely to be exposed to received levels of seismic pulses that could cause TTS, it is highly unlikely that they would sustain permanent hearing impairment. If we assume that the TTS threshold for odontocetes for exposure to a series of seismic pulses may be on the order of 220 dB re 1 microPa (pk-pk) (approximately 204 dB re 1 microPa rms), then the PTS threshold might be about 240 dB re 1 microPa (pk-pk). In the units used by geophysicists, this is 10 bar-m. Such levels are found only in the immediate vicinity of the largest airguns (Richardson *et al.*, 1995; Caldwell and Dragoset, 2000). However, as noted previously in this document, it is very unlikely that an odontocete would remain within a few meters of a large airgun for sufficiently long to incur

PTS. The TTS (and thus PTS) thresholds of baleen whales and pinnipeds may be lower, and thus may extend to a somewhat greater distance from the source. However, baleen whales generally avoid the immediate area around operating seismic vessels, so it is unlikely that a baleen whale could incur PTS from exposure to airgun pulses. Some pinnipeds do not show strong avoidance of operating airguns.

In summary, during this project, it is highly unlikely that marine mammals could receive sounds strong enough and over a sufficient period of time to cause permanent hearing impairment. In the proposed project marine mammals are unlikely to be exposed to received levels of seismic pulses strong enough to cause TTS, and because of the higher level of sound necessary to cause PTS, it is even less likely that PTS could occur. This is due to the fact that even levels immediately adjacent to the single GI-airgun may not be sufficient to induce PTS because the mammal would not be exposed to more than one strong pulse unless it swam alongside an airgun for a period of time.

Strandings and Mortality

Marine mammals close to underwater detonations of high explosives can be killed or severely injured, and the auditory organs are especially susceptible to injury (Ketten *et al.*, 1993; Ketten, 1995). Airgun pulses are less energetic and have slower rise times than underwater detonations. While there is no documented evidence that airgun arrays can cause serious injury, death, or stranding, the association of mass strandings of beaked whales with naval exercises and, in one case, an L-DEO seismic survey have raised the possibility that beaked whales may be especially susceptible to injury and/or behavioral reactions that can lead to stranding when exposed to strong pulsed sounds.

It is important to note that seismic pulses and mid-frequency military sonar pulses are quite different. Sounds produced by the types of airgun arrays used to profile sub-sea geological structures are broadband with most of the energy below 1 kHz. Typical military mid-frequency sonars operate at frequencies of 2 to 10 kHz, generally with a relatively narrow bandwidth at any one time (though the center frequency may change over time). Because seismic and sonar sounds have considerably different characteristics and duty cycles, it is not appropriate to assume that there is a direct connection between the effects of military sonar and seismic surveys on marine mammals. However, evidence that sonar pulses can, in special circumstances, lead to hearing damage and, indirectly, mortality suggests that caution is warranted when dealing with exposure of marine mammals to any high-intensity pulsed sound.

In addition to mid-frequency sonar-related strandings (see 69 FR 74906 (December 14, 2004) for additional discussion), there was a September, 2002 stranding of two Cuvier's beaked whales in the Gulf of California (Mexico) when a seismic survey by the *R/V Maurice Ewing* was underway in the general area (Malakoff, 2002). The airgun array in use during that project was the *Ewing*'s 20–gun 8490–in^3 array. This might be a first indication that seismic surveys can have effects, at least on beaked whales, similar to the suspected effects of naval sonars. However, the evidence linking the Gulf of California strandings to the seismic surveys is inconclusive, and is not based on any physical evidence (Hogarth, 2002; Yoder, 2002). The ship was also operating its multi-beam bathymetric sonar at the same time but this sonar had much less potential than these naval sonars to affect beaked whales. Although the link between the Gulf of California strandings and the seismic (plus multi-beam sonar) survey is inconclusive, this event, in addition to the various incidents involving beaked whale strandings associated with naval exercises, suggests a need for caution in conducting seismic surveys in areas occupied by beaked whales.

The present project will involve lower-energy sound sources than used in typical seismic surveys. That, along with the monitoring and mitigation measures that are planned, and the infrequent occurrence of beaked whales in the project area, will minimize any possibility for strandings and mortality.

Non-auditory Physiological Effects

Possible types of non-auditory physiological effects or injuries that might theoretically occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. There is no evidence that any of these effects occur in marine mammals exposed to sound from airgun arrays. However, there have been no direct studies of the potential for airgun pulses to elicit any of these effects. If any such effects do occur, they would probably be limited to unusual situations when animals might be exposed at close range for unusually long periods.

Long-term exposure to anthropogenic noise may have the potential to cause physiological stress that could affect the health of individual animals or their reproductive potential, which could theoretically cause effects at the population level (Gisner (ed.), 1999). However, there is essentially no information about the occurrence of noise-induced stress in marine mammals. Also, it is doubtful that any single marine mammal would be exposed to strong seismic sounds for sufficiently long that significant physiological stress would develop. That is especially so in the case of the present project which will deploy only 1 or 2 airguns, the ship is moving 3 4 knots, and for the most part the tracklines will not ''double back'' through the same area.

Gas-filled structures in marine animals have an inherent fundamental resonance frequency. If stimulated at this frequency, the ensuing resonance could cause damage to the animal. There may also be a possibility that high sound levels could cause bubble formation in the blood of diving mammals that in turn could cause an air embolism, tissue separation, and high, localized pressure in nervous tissue (Gisner (ed), 1999; Houser *et al.*, 2001). In 2002, NMFS held a workshop (Gentry (ed.), 2002) to discuss whether the stranding of beaked whales in the Bahamas in 2000 might have been related to air cavity resonance or bubble formation in tissues caused by exposure to noise from naval sonar. A panel of experts concluded that resonance in air-filled structures was not likely to have caused this stranding. Among other reasons, the air spaces in marine mammals are too large to be susceptible to resonant frequencies emitted by mid- or low-frequency sonar; lung tissue damage has not been observed in any mass, multi-species stranding of beaked whales; and the duration of sonar pings is likely too short to induce vibrations that could damage tissues (Gentry (ed.), 2002).

Opinions were less conclusive about the possible role of gas (nitrogen) bubble formation/growth in the Bahamas stranding of beaked whales. Workshop participants did not rule out the possibility that bubble formation/growth played a role in the stranding and participants acknowledged that more research is needed in this area. The only available information on acoustically-mediated bubble growth in marine mammals is modeling that assumes prolonged exposure to sound.

A short paper concerning beaked whales stranded in the Canary Islands in 2002 suggests that cetaceans might be subject to decompression injury in some situations (Jepson *et al.*, 2003). If so, that might occur if they ascend unusually quickly when exposed to aversive sounds. However, the interpretation that the effect was related to decompression injury is unproven (Piantadosi and Thalmann, 2004; Fernandez *et al.*, 2004). Even if that effect can occur during exposure to mid-frequency sonar, there is no evidence that this type of effect occurs in response to low-frequency airgun sounds. It is especially unlikely in the case of the proposed survey, involving only 1 or 2 airguns that will operate in any one location only briefly.

In summary, little is known about the potential for seismic survey sounds to cause either auditory impairment or other non-auditory physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would be limited to short distances from the sound source. However, the available data do not allow for meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in these ways. Marine mammals that show behavioral avoidance of seismic vessels, including most baleen whales, some odontocetes, and some pinnipeds, are unlikely to incur auditory impairment or other physical effects. Also, the planned mitigation and monitoring measures are expected to minimize any possibility of serious injury, mortality or strandings.

Possible Effects of Mid-frequency Sonar Signals

A SeaBeam 2112 multi-beam 12–kHz bathymetric sonar system and a sub-bottom profiler will be operated from the source vessel nearly continuously during the planned study. A pinger will be operated during all coring.

Sounds from the SeaBeam 2112 multi-beam sonar system are very short pulses, depending on water depth. Most of the energy in the sound pulses emitted by the multi-beam is at moderately high frequencies, centered at 12 kHz. The beam is narrow (approximately 2) in fore-aft extent and wide (approximately 130°) in the cross-track extent. Any given mammal at depth near the trackline would be in the main beam for only a fraction of a second. Navy sonars that have been linked to avoidance reactions and stranding of cetaceans generally: (1) are more powerful than the SeaBeam 2112 sonar, (2) have a longer pulse duration, and (3) are directed close to horizontally (vs. downward for the SeaBeam sonars). The area of possible influence of the bathymetric sonar is much smaller-a narrow band oriented in the cross-track direction below the source vessel. Marine mammals that encounter the bathymetric sonar at close range are unlikely to be subjected to repeated pulses because of the narrow fore-aft width of the beam, and will receive only small amounts of pulse energy because of the short pulses and ship speed. In assessing the possible impacts of the 15.5–kHz Atlas Hydrosweep (similar to the SeaBeam sonar), Boebel et al. (2004) noted that the critical sound pressure level at which TTS may occur is 203.2 dB re 1 microPa (rms). The critical region included an area of 43 m (141 ft) in depth, 46 m (151 ft) wide athwartship, and 1 m (3.3 ft) fore-and-aft (Boebel et al., 2004). In the more distant parts of that (small) critical region, only slight TTS would be incurred. Therefore, as harassment or injury from pulsed sound is a function of total energy received, the actual harassment or injury threshold for the bathymetric sonar signals (approximately 10 ms) would be at a much higher dB level than that for longer duration pulses such as seismic signals. As a result, NMFS believes that marine mammals are unlikely to be harassed or injured from the SeaBeam multibeam sonars.

Sounds from the sub-bottom profiler are very short pulses; pulse duration ranges from 0.5 to 25 milliseconds, and the interval between pulses can range between 0.25 s and 10 s, depending upon water depth. A 3.5–kHz transducer emits a conical beam with a width of 26° and the 12 kHz transducer emits a conical beam with a width of 30°. The swept (chirp) frequency ranges from 2.75 kHz to 6 kHz. Most of the energy from the sub-bottom profiler is directed downward from the transducer array. Sound levels have not been measured directly for the sub-bottom profiler used by the Healy, but Burgess and Lawson (2000) measured sounds propagating more or less horizontally from a similar unit with similar source output (205 dB re 1 microPa m). The 160– and 180– dB re 1 microPa rms radii, in the horizontal direction, were estimated to be, respectively, near 20 m (66 ft) and 8 m (26 ft) from the source, as measured in 13 m or 43 ft water depth. The corresponding distances for an animal in the beam below the transducer would be greater, on the order of 180 m (591 ft) and 18 m (59 ft), assuming spherical spreading.

Sounds from the 12–kHz pinger are very short pulses, occurring for 0.5, 2, or 10 ms once every second, with source level approximately 192 dB re 1 microPa at a one pulse per second rate. The 12–kHz signal is omnidirectional. The pinger produces sounds that are within the range of frequencies used by small odontocetes and pinnipeds that occur or may occur in the area of the planned survey.

Masking by Mid-frequency Sonar Signals

Marine mammal communications will not be masked appreciably by the multibeam sonar signals or the sub-bottom profiler given the low duty cycle and directionality of the sonars and the brief period when an individual mammal is likely to be within its beam. Furthermore, the 12–kHz multi-beam will not overlap with the predominant frequencies in baleen whale calls, further reducing any potential for masking in that group.

While the 12–kHz pinger produces sounds within the frequency range used by odontocetes that may be present in the survey area and within the frequency range heard by pinnipeds, marine mammal communications will not be masked appreciably by the pinger signals. This is a consequence of the relatively low power output, low duty cycle, and brief period when an individual mammal is likely to be within the area of potential effects. In the case of mysticetes, the pulses do not overlap with the predominant frequencies in the calls, which would avoid significant masking.

Behavioral Responses Resulting from Mid-frequency Sonar Signals

Behavioral reactions of free-ranging marine mammals to military and other sonars appear to vary by species and circumstance. Observed reactions have included silencing and dispersal by sperm whales (Watkins *et al.*, 1985), increased vocalizations and no dispersal by pilot whales (Rendell and Gordon, 1999), and the previously-mentioned strandings by beaked whales. Also, Navy personnel have described observations of dolphins bow-riding adjacent to bow-mounted mid-frequency sonars during sonar transmissions. However, all of these observations are of limited relevance to the present situation. Pulse durations from these sonars were much longer than those of the bathymetric sonars to be used during the proposed survey, and a given mammal would have received many pulses from the naval sonars. During UAF's operations, the individual pulses will be very short, and a given mammal would not receive many of the downward-directed pulses as the vessel passes by.

Captive bottlenose dolphins and a white whale exhibited changes in behavior when exposed to 1–s pulsed sounds at frequencies similar to those that will be emitted by the bathymetric sonar to be used by UAF and to shorter broadband pulsed signals. Behavioral changes typically involved what appeared to be deliberate attempts to avoid the sound exposure (Schlundt *et al.*, 2000; Finneran *et al.*, 2002). The relevance of these data to free-ranging odontocetes is uncertain and in any case the test sounds were quite different in either duration or bandwidth as compared to those from a bathymetric sonar.

UAF and NMFS are not aware of any data on the reactions of pinnipeds to sonar sounds at frequencies similar to those of the 12–kHz multibeam sonar. Based on observed pinniped responses to other types of pulsed sounds, and the likely brevity of exposure to the bathymetric sonar sounds, pinniped reactions are expected to be limited to startle or otherwise brief responses of no lasting consequences to the individual animals.

The pulsed signals from the pinger are much weaker than those from the bathymetric sonars and sub-bottom profiler. In summary, NMFS does not anticipate behavioral disturbance from the mid-frequency sources discussed unless marine mammals get very close to the source.

Hearing Impairment and Other Physical Effects

Given recent stranding events that have been associated with the operation of naval sonar, there is concern that sonar noise can cause serious impacts to marine mammals. However, the multi-beam sonars proposed for use by UAF are quite different than sonars used for navy operations. Pulse duration of the bathymetric sonars is very short relative to the naval sonars. Also, at any given location, an individual marine mammal would be in the beam of the multi-beam sonar for much less time given the generally downward orientation of the beam and its narrow fore-aft beam-width. (Navy sonars often use near-horizontally-directed sound.) These factors would all reduce the sound energy received from the multi-beam sonar relative to that from the sonars used by the Navy. Therefore, hearing impairment by multi-beam bathymetric sonar is unlikely.

Source levels of the sub-bottom profiler are much lower than those of the airguns and the multi-beam sonar, which are discussed above. Sound levels from a sub-bottom profiler similar to the one on the *Healy* were estimated to decrease to 180 dB re 1 μPa (rms) at 8 m (26 ft) horizontally from the source (Burgess and Lawson, 2000), and at approximately 18 m (59 ft) downward from the source. Furthermore, received levels of pulsed sounds that are necessary to cause temporary or especially permanent hearing impairment in marine mammals appear to be higher than 180 dB (see earlier). Thus, it is unlikely that the sub-bottom profiler produces pulse levels strong enough to cause hearing impairment or other physical injuries even in an animal that is (briefly) in a position near the source. The sub-bottom profiler is usually operated simultaneously with other higher-power acoustic sources. Many marine mammals will move away in response to the approaching higher-power sources or the vessel itself before the mammals would be close enough for there to be any possibility of effects from the less intense sounds from the sub-bottom profiler. In the case of mammals that do not avoid the approaching vessel and its various sound sources, mitigation measures that would be applied to minimize effects of the higher-power sources would further reduce or eliminate any minor effects of the sub-bottom profiler. Given the brevity of the pulses from each source [sub-bottom profiler, multi-beam sonar, airgun(s)], and the directionality of the first two sources, it would be rare for an animal to receive pulses from 2 or 3 of the sources simultaneously. In the unlikely event that simultaneous reception did occur, the combined received level would be little different from that attributable to the strongest single source (see equation 2.9 in Richardson *et al.* 1995, p. 30).

Source levels of the pinger are much lower than those of the G. airgun and bathymetric sonars. It is unlikely that the pinger produces pulse levels strong enough to cause temporary hearing impairment or (especially) physical injuries even in an animal that is (briefly) in a position near the source.

Estimates of Take by Harassment for the Arctic Ocean Seismic Survey

Given the proposed mitigation (see Mitigation later in this document), all anticipated takes involve a temporary change in behavior that may constitute Level B harassment. The proposed mitigation measures will minimize or eliminate the possibility of Level A harassment or mortality. UAF has calculated the ‘‘best estimates’’ for the numbers of animals that could be taken by Level B harassment during the proposed Arctic Ocean seismic survey using data obtained during marine mammal surveys in and near the Arctic Ocean by Stirling *et al.* (1982), Kingsley (1986), Christensen *et al.* (1992), Koski and Davis (1994), Moore (2000a), Whitehead (2002), and Moulton and Williams (2003), and on estimates of the sizes of the areas where effects could potentially occur (Table 2).

This section provides estimates of the number of potential ‘‘exposures’’ of marine mammals to sound levels ≥160, the criteria for the onset of Level B Harassment, by operations with the two-G. gun array (500 in^3) or the single Bolt airgun (1200 in^3). No animals are expected to exhibit responses to the sonars, sub-bottom profiler, or pinger given their characteristics described previously (e.g., narrow, downward-directed beam). Therefore, no additional incidental takings are included for animals that might be affected by the multi-beam sonars or 12–kHz pinger.

Table 2 incorporates corrected density estimates and provides the best estimate of the numbers of each species that would be exposed to seismic sounds greater than 160 dB. Estimates are based on consideration of numbers of marine mammals that might be disturbed by 5075 km of seismic surveys across the Arctic Ocean, which includes a 25 percent allowance over the planned 4060–km track to allow for turns, lines that might have to be repeated due to poor data quality, or for minor changes to the survey design. A detailed description on the methodology used by UAF to arrive at the estimates of Level B harassment takes that are provided in Table 2 can be found in UAF’s IHA application for the Arctic Ocean survey.

Table 2. Estimates of the possible numbers of marine mammal exposures to 160 dB during UAF’s proposed seismic program in the polar pack ice between Alaska and Svalbard, August-September 2005. The proposed sound sources are two G. guns with volume 250 in3 each or a single Bolt airgun with volume 1200 in3. Received levels of airgun sounds are expressed in dB re 1 μPa (rms, averaged over pulse duration). Species with stars are listed as endangered under the ESA.

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Table 2. Estimates of the possible numbers of marine mammal exposures to 160 dB during UAF's proposed seismic program in the polar pack ice between Alaska and Svalbard, August-September 2005. The proposed sound sources are two G. guns with volume 250 in^3 each or a single Bolt airgun with volume 1200 in^3. Received levels of airgun sounds are expressed in dB re 1 μPa (rms, averaged over pulse duration). Species with stars are listed as endangered under the ESA.

	Number of Exposures to Sound Levels ≥ 160dB								
	Best Estimate				Maximum Estimate				
Species	Barrow	Polar Pack	Svalbard	Total	Barrow	Polar Pack	Svalbard	Total	Requested Take
Delphinidae									
Atlantic white-beaked dolphin	0	0	0	0	0	0	0	0	**10**
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	**10**
Killer whale	0	0	0	0	0	0	0	0	**5**
Long-finned pilot whale	0	0	0	0	0	0	0	0	**10**
Total Delphinids	0	0	0	0	0	0	0	0	
Odontocetes									
* Sperm whale	0	0	0	0	0	0	5	5	**5**
Ziphidae									
Northern bottlenose whale	0	0	0	0					
Mondontidae									
Beluga	27	2	0	29	107	10	0	117	**117**
Narwhal	0	38	1	39	1	153	2	156	**156**
Phocoenidae									
Harbor porpoise	0	0	0	0	2	0	0	2	**5**
Mysticetes									
* North Atlantic right whale	0	0	0	0	0	0	0	0	**2**
* Bowhead whale	51	9	0	61	202	36	0	238	**238**
Gray whale	35	0	0	35	141	0	0	141	**141**
* Humpback whale	0	0	0	0	0	0	0	0	**5**
Minke whale	0	0	0	0	0	0	0	0	**5**
* Sei whale	0	0	0	0	0	0	0	0	**5**
* Fin whale	0	0	0	0	0	0	0	0	**5**
* Blue whale	0	0	0	0	0	0	0	0	**5**
Total Other Cetaceans	113	50	2	164	452	198	10	661	
Pinnipeds									
Walrus	2	0	0	2	8	0	0	8	
Bearded seal	101	17	12	131	179	70	21	270	**270**
Harbor seal	0	0	0	0	0	0	0	0	**0**
Spotted seal	1	0	0	1	4	0	0	4	**5**
Ringed seal	1986	152	236	2373	3512	607	417	4536	**4536**
Hooded seal	0	0	4	4	0	0	7	7	**7**
Harp seal	0	0	12	12	0	0	21	21	**21**
Total Pinnipeds	2090	169	264	2523	3703	677	467	4847	
Carnivora									
Polar bear	13	2	2	17	32	5	4	41	

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Preliminary Conclusions

Effects on Cetaceans

Strong avoidance reactions by several species of mysticetes to seismic vessels have been observed at ranges up to 6–8 km (3–4 n.mi) and occasionally as far as 20–30 km (11–16 n.mi) from the source vessel, although, the sources in these observations were more powerful than those used in this project. However, reactions at the longer distances appear to be atypical of most species and situations, particularly when feeding whales are involved (Miller *et al.* 2005). Fewer than 95 mysticetes are expected to be encountered during the proposed survey in the Arctic Ocean (Table 2) and disturbance effects would be confined to shorter distances given the relatively low-energy acoustic source to be used during this project. Also, based on calibration of 160 dB radii data obtained in deep water (Tolstoy *et al.*, 2004), the estimated numbers presented in Table 2 are considered overestimates of actual numbers that may be harassed.

Odontocete reactions to seismic pulses, or at least the reactions of dolphins, are expected to extend to lesser distances than are those of mysticetes. Odontocete low-frequency hearing is less sensitive than that of mysticetes, and dolphins are often seen from seismic vessels. In fact, there are documented instances of delphinids and Dall's porpoise approaching active seismic vessels. However, dolphins, as well as some other types of odontocetes, sometimes show avoidance responses and/or other changes in behavior when near operating seismic vessels.

Taking into account the small total volume and relatively low sound output of the sources proposed in this project, and the mitigation measures that are planned, effects on cetaceans are generally expected to be limited to avoidance of a small area around the seismic 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 affected populations, as described below.

Based on the 160–dB criterion, the best estimates of the numbers of individual cetaceans that may be exposed to sounds ≥160 dB re 1 microPa (rms) represent <1 percent of the populations of each species in the Arctic Ocean and adjacent waters. For species listed as endangered under the Endangered Species Act (ESA), estimates include no North Atlantic right whales, humpback, sei whales, fin or blue whales; <0.1 percent of the Northeast Atlantic Ocean population of sperm whales, and ≤0.6 percent of the Bering-Chukchi-Beaufort bowhead whale population of >10,470+. In the cases of belugas, narwhals and gray whales, the potential reactions are expected to involve no more than small numbers (29 to 35) of exposures.

It is unlikely that any North Atlantic right whales (or Northeast Atlantic bowheads) will be exposed to seismic sounds ≥160 dB re 1 microPa (rms). However, UAF requests authorization to expose up to two North Atlantic right whales to ≥160 dB, given the possibility of encountering one or more of this endangered species. If a right whale is sighted by the vessel-based observers, or if a bowhead is sighted in the Svalbard area, the airgun(s) will be shut down regardless of the distance of the whale from the airgun(s).

Low numbers of monodontids may be exposed to sounds produced by the 1 or 2 airguns during the proposed seismic study, and the numbers potentially affected are small relative to the population sizes. The best estimates of the numbers of belugas and narwhals that might be exposed to ≥160 dB represent <1 percent of their populations. This assumes that narwhals encountered in the polar pack ice in the central Arctic Ocean belong to the Baffin Bay Davis Strait population. If they are actually members of the East Greenland population, then the estimated size of that population is too low because it did not include surveys of the central Arctic Ocean.

Two estimates of the numbers of marine mammals that might be exposed to sounds from the 2–G. gun array or the single Bolt airgun during the 2005 trans-Arctic seismic survey were presented in Table 2, depending on the density criteria used (best vs. maximum). UAF requested ''take authorizations'' for each species based on the estimated maximum number of exposures to ≥160 dB re 1 microPa (rms), i.e., the highest of the various estimates. That figure likely overestimates the actual number of animals that will be exposed to the sound (see above). Even so, the estimates for the proposed survey are quite low percentages of the population sizes.

Mitigation measures such as controlled speed, course alteration, observers, ramp ups, and shut downs when marine mammals are seen within defined ranges should further reduce short-term reactions, and minimize any effects on hearing. In all cases, the effects are expected to be short-term, with no lasting biological consequence. In light of the type of take expected and the small percentages of affected stocks of cetaceans, the action is expected to have no more than a negligible impact on the affected species or stocks of cetaceans.

Effects on Pinnipeds

Two pinniped species (ringed seal and bearded seal) are likely to be encountered in the study area. Also, it is possible that a small number (0–12) of harp seals, hooded seals, spotted seals, harbor seals, or walruses may be encountered. An estimated 2373 individual ringed seals and 131 bearded seals (<0.5 percent their Arctic Ocean and adjacent waters population) may be exposed to airgun sounds at received levels greater than or equal to 160 dB re 1 microPa (rms) during the seismic survey. It is probable that only a small percentage of those would actually be disturbed. Effects are expected to be limited to short-term and localized behavioral changes falling within the MMPA definition of Level B harassment. As is the case for cetaceans, the short-term exposures to sounds from the sources in this project are not expected to result in any long-term consequences for the individuals or their populations and the activity is expected to have no more than a negligible impact on the affected species or stocks of pinnipeds.

Effects on Polar Bears

Effects on polar bears are anticipated to be minor at most. Although the best estimate of polar bears that will be encountered during the survey is 16, almost all of these would be on the ice, and therefore they would be unaffected by underwater sound from the airgun(s). For the few bears that are in the water, levels of airgun and sonar sound would be attenuated because polar bears generally do not dive much below the surface. Received levels of airgun sound are reduced substantially just below the surface, relative to those at deeper depths, because of the pressure release effect at the surface

Potential Effects on Habitat

The proposed seismic survey will not result in any permanent impact on habitats used by marine mammals, or to the food sources they utilize. The main impact issue associated with the proposed activity will be temporarily elevated noise levels and the associated direct effects on marine mammals.

One of the reasons for the adoption of airguns as the standard energy source for marine seismic surveys was that they (unlike the explosives used in the distant past) do not result in any appreciable fish kill. Various experimental studies showed that airgun discharges cause little or no fish kill, and that any injurious effects were generally limited to the water within a meter or so of an airgun. However, it has recently been found that injurious effects on captive fish, especially on fish hearing, may occur at somewhat greater distances than previously thought (McCauley *et al.*, 2000a,b, 2002; 2003). Even so, any injurious effects on fish would be limited to short distances from the source. Also, many of the fish that might otherwise be within the injury-zone are likely to be displaced from this region prior to the approach of the airguns through avoidance reactions to the passing seismic vessel or to the airgun sounds as received at distances beyond the injury radius.

Fish often react to sounds, especially strong and/or intermittent sounds of low frequency. Sound pulses at received levels of 160 dB re 1 microPa (peak) may cause subtle changes in behavior. Pulses at levels of 180 dB (peak) may cause noticeable changes in behavior (Chapman and Hawkins, 1969; Pearson *et al.*, 1992; Skalski *et al.*, 1992). It also appears that fish often habituate to repeated strong sounds rather rapidly, on time scales of minutes to an hour. However, the habituation does not endure, and resumption of the disturbing activity may again elicit disturbance responses from the same fish.

Fish near the airguns are likely to dive or exhibit some other kind of behavioral response. This might have short-term impacts on the ability of cetaceans to feed near the survey area. However, only a small fraction of the available habitat would be ensonified at any given time, and fish species would return to their pre-disturbance behavior once the seismic activity ceased. Thus, the proposed surveys would have little impact on the abilities of marine mammals to feed in the area where seismic work is planned. Some of the fish that do not avoid the approaching airguns (probably a small number) may be subject to auditory or other injuries.

Zooplankton that are very close to the source may react to the airgun's shock wave. These animals have an exoskeleton and no air sacs; therefore, little or no mortality is expected. Many crustaceans can make sounds and some crustacea and other invertebrates have some type of sound receptor. However, the reactions of zooplankton to sound are not known. Some mysticetes feed on concentrations of zooplankton. A reaction by zooplankton to a seismic impulse would only be relevant to whales if it caused a concentration of zooplankton to scatter. Pressure changes of sufficient magnitude to cause this type of reaction would probably occur only very close to the source, so few zooplankton concentrations would be affected. Impacts on zooplankton behavior are predicted to be negligible, and this would translate into negligible impacts on feeding mysticetes.

Potential Effects on Subsistence Use of Marine Mammals

Subsistence remains the basis for Alaska Native culture and community. Subsistence hunting and fishing continue to be prominent in the household economies and social welfare of some Alaskan residents, particularly among those living in small, rural villages (Wolfe and Walker, 1987). 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.

Marine mammals are legally hunted in Alaskan waters near Barrow by coastal Alaska Natives. Nearby communities with subsistence economies include Barrow, Nuisqsut, and Kaktovik. Species hunted include: bowhead whales, beluga whales, ringed, spotted, and bearded seals, walrus, and polar bears. In the Barrow area, bowhead whales provided approximately 69 percent of the total weight of marine mammals harvested from April 1987 to March 1990. During that time, on a numerical basis, ringed seals were harvested the most frequently (394 animals). More detailed information regarding the level of subsistence by species is provided in the application (UAF, 2005).

In the event that both marine mammals and hunters would be near the Healy when it begins operating north of Barrow, the proposed project could potentially impact the availability of marine mammals for harvest in a very small area immediately around the Healy. However, the majority of marine mammals are taken by hunters within approximately 33 km (18 n.mi) off shore, and the *Healy* is expected to commence the seismic survey farther offshore than that. Operations in that area are scheduled to occur in August, and hunting in offshore waters generally does not occur at that time of year (the bowhead hunt near Barrow normally does not begin until more than a month later). Considering that, and the limited times and location where the planned seismic survey overlaps with hunting areas, the proposed project is not expected to have an unmitigable adverse effect on the availability of marine mammals for subsistence harvest.

In Norwegian waters, a limited amount of hunting takes place on or near Svalbard. The human population of Svalbard is approximately 1700. Of the marine mammals found near Svalbard only the minke whale, bearded seal, and ringed seal may be taken by local hunters (the commercial sealing grounds for harp and hooded seals are distant from Svalbard). The seismic survey will terminate northwest of Svalbard territorial waters. Any ship operations closer to Svalbard will be similar to those of other vessels operating in the area, will not involve airgun operations, and will not adversely impact subsistence harvests.

Mitigation

For the proposed seismic survey in the Arctic Ocean in August - September 2005, UAF will use airgun sources involving one or two airguns and a downward direction of energy. The downward directional nature of the airgun(s) to be used in this project is an important mitigating factor as it will result in reduced sound levels at any given horizontal distance as compared with the levels expected at that distance if the source were omnidirectional with the stated nominal source level. The relatively small size of these sources is also an important mitigation measure that will reduce the potential for effects relative to those that might occur with large airgun arrays. This measure is in conformance with NMFS policy of encouraging seismic operators to use the lowest intensity airguns practical to accomplish research objectives.

The following mitigation measures, as well as marine mammal visual monitoring (discussed later in this document), will be implemented for the subject seismic survey: (1) speed and course alteration (provided that they do not compromise operational safety requirements); (2) power or shut-down procedures; (3) special mitigation measures (shut-downs) for the North Atlantic right whale and Northeast Atlantic bowhead whale, because of special concern associated with their very low population sizes, and (4) ramp-up procedures.

Speed and Course Alteration

If a marine mammal is detected outside its respective safety zone (180 dB for cetaceans, 190 dB for pinnipeds) and, based on its position and the relative motion, is likely to enter the safety zone, the vessel's speed and/or direct course may, when practical and safe, be changed in a manner that also minimizes the effect to 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 safety zone. If the mammal appears likely to enter the safety zone, further mitigative actions will be taken (i.e., either further course alterations or shut down of the airguns).

Power-down Procedures

A power down involves decreasing the number of airguns in use such that the radius of the 180–dB (or 190–dB) zone is decreased to the extent that marine mammals are not in the safety zone. A power down may also occur when the vessel is moving from one seismic line to another. During a power down, one airgun is operated. In this project, a power down is possible when the two G. gun array is in use, but not when single Bolt airgun is in use. The continued operation of one airgun is intended to alert marine mammals to the presence of the seismic vessel in the area. In contrast, a shut down occurs when all airgun activity is suspended.

If a marine mammal is detected outside the safety radius but is likely to enter the safety radius, and if the vessel's speed and/or course cannot be changed to avoid having the mammal enter the safety radius, the airguns may (as an alternative to a complete shut down) be powered down before the mammal is within the safety radius. Likewise, if a mammal is already within the safety zone 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 2–G. gun system, one airgun (e.g., 250 in^3) will be operated. If a marine mammal is detected within or near the smaller safety radius around that single airgun (Table 2), the other airgun will be shut down (see next subsection).

Following a power down, airgun activity will not resume until the marine mammal has cleared the safety zone. The safety zones for both one and two Sodera 250–in^3 G. guns, as well as the single 1200–in3 Bolt airgun at both 180 and 190 dB, are described in Table 1. The animal will be considered to have cleared the safety zone if it is visually observed to have left the safety zone, if it has not been seen within the zone for 15 minutes in the case of small odontocetes and pinnipeds, or if it has not been seen within the zone for 30 minutes in the case of mysticetes and large odontocetes, including sperm and beaked whales.

Shut-down Procedures

The operating airgun(s) will be shut down completely if a marine mammal approaches or enters the then-applicable safety radius and a power down is not practical. The operating airgun(s) will also be shut down completely if a marine mammal approaches or enters the estimated safety radius of the source that would be used during a power down.

Airgun activity will not resume until the marine mammal has cleared the safety radius. The animal will be considered to have cleared the safety radius if it is visually observed to have left the safety radius, or if it has not been seen within the radius for 15 min (small odontocetes, pinnipeds, and sea turtles) or 30 min (mysticetes and large odontocetes, including sperm and beaked whales).

Start-Up Procedures

A ''ramp up'' procedure will be followed when the 2–G. gun cluster begins operating after a specified-duration period without airgun operations. NMFS normally recommends that the rate of ramp up be no more than 6 dB per 5–min period. The specified period depends on the speed of the source vessel and the size of the airgun array being used. Ramp up will begin with one of the two G. guns (250 in*3*). The other G. gun will be added after a period of 5 min. This will result in an increase of no more than 6 dB per 5–min period when going from one G. gun to the full two G. gun system, which is the normal rate of ramp up for larger airgun arrays. During the ramp up (i.e. when only one G. gun is operating), the safety zone for the full two G. gun system will be maintained.

If the complete safety radius 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 one G. gun has been operating during the interruption of the seismic survey operations. This means that it will not be permissible to ramp up the two-G. gun source from a complete shut down in thick fog or at other times when the outer part of the safety zone is not visible. If the entire safety radius is visible using vessel lights and/or night vision devices (NVDs) (as may be possible under moonlit and calm conditions), then start up of the airguns from a 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 chose. Ramp up of the airguns will not be initiated if a marine mammal is sighted within or near the applicable safety radii during the day or a night.

Marine Mammal Monitoring

Vessel-based marine mammal observers (MMOs) will monitor marine mammals near the seismic source vessel during all daytime hours and during any start ups of the airgun(s) at night. Airgun operations will be powered down or shut down when marine mammals are observed within, or about to enter, designated safety radii where there is a possibility of significant effects on hearing or other physical effects. Vessel-based MMOs 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 and during coring operations).

During seismic operations across the Arctic Ocean, four observers will be based aboard the vessel. MMOs will be appointed by UAF with NMFS concurrence. A Barrow resident knowledgeable about the mammals and fish of the area is expected to be included in the MMO team aboard the Healy. At least one observer, and when practical two observers, will monitor marine mammals near the seismic vessel during ongoing daytime operations and nighttime start ups of the airgun. Use of two simultaneous observers will increase the proportion of the animals present near the source vessel that are detected. MMOs will normally be on duty in shifts of duration no longer than 4 hours. The USCG crew will also be instructed to assist in detecting marine mammals and implementing mitigation requirements (if practical). Before the start of the seismic survey the crew will be given additional instruction on how to do so.

The *Healy* is a suitable platform for marine mammal observations. When stationed on the flying bridge, the eye level will be 27.7 m (91 ft) above sea level, and the observer will have an unobstructed view around the entire vessel. If surveying from the bridge, the observer's eye level will be 19.5 m (64 ft) above sea level and approximately 25° of the view will be partially obstructed directly to the stern by the stack. During daytime, the MMOs will scan the area around the vessel systematically with reticle binoculars (e.g., 7 50 Fujinon) and with the naked eye. During darkness, NVDs will be available (ITT F500 Series Generation 3 binocular-image intensifier or equivalent), if and when required. Laser rangefinding binoculars (Leica LRF 1200 laser rangefinder or equivalent) will be available to assist with distance estimation. Those are useful in training observers to estimate distances visually, but are generally not useful in measuring distances to animals directly.

Taking into consideration the additional costs of prohibiting nighttime operations and the likely impact of the activity (including all mitigation and monitoring), NMFS has preliminarily determined that the proposed mitigation and monitoring ensures that the activity will have the least practicable impact on the affected species or stocks. Two marine mammal observers will be required to monitor the safety radii (using shipboard lighting or NVDs at night) for at least 30 minutes before ramp-up begins and verify that no marine mammals are in or approaching the safety radii; start-up may not begin unless the entire safety radii are visible; and marine mammals will have sufficient notice of a vessel approaching with an operating seismic airgun, thereby giving them an opportunity to avoid the approaching noise source. Additionally, a power-down or shut-down will occur if a marine mammal is detected within the safety radius.

Reporting

UAF will submit a report to NMFS within 90 days after the end of the cruise. The report will describe the operations that were conducted and the marine mammals that were detected near the operations. The report will provide full documentation of methods, results, and interpretation pertaining to all 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 report will also include estimates of the amount and nature of potential ''take'' of marine mammals by harassment or in other ways.

Endangered Species Act (ESA)

Under section 7 of the ESA, the National Science Foundation (NSF), the agency funding UAF, has begun consultation on this proposed seismic survey. NMFS will also consult on the issuance of an IHA under section 101(a)(5)(D) of the MMPA for this activity. Consultation will be concluded prior to a determination on the issuance of an IHA. Preliminarily, NMFS believes that the only ESA listed species that may experience Level B Harassment is the bowhead whale.

National Environmental Policy Act (NEPA)

The NSF and UAF have prepared an Environmental Assessment (EA) for the oceanographic survey planned for the Arctic Ocean. NMFS has posted this EA on the NMFS website and solicits public comments regarding impacts to marine mammals. NMFS will review the EA and the public comments and subsequently either adopt it or prepare its own NEPA document before making a determination on the issuance of an IHA. The EA for this activity is available upon request or on the NMFS website (see **ADDRESSES**). Comments regarding impacts to marine mammals may be submitted by mail, fax, or email (see **ADDRESSES**). All other comments should be addressed to UAF or the National Science Foundation.

Preliminary Conclusions

NMFS has preliminarily determined that the impact of conducting the seismic survey in the Arctic Ocean may result, at worst, in a temporary modification in behavior by certain species of marine mammals. This activity is expected to result in no more than a negligible impact on the affected species or stocks.

For reasons stated previously in this document, this preliminary determination is supported by: (1) the likelihood that, given sufficient notice through slow ship speed and ramp-up, marine mammals are expected to move away from a noise source that is annoying prior to its becoming potentially injurious; (2) recent research that indicates that TTS is unlikely (at least in delphinids) until levels closer to 200–205 dB re 1 microPa are reached rather than 180 dB re 1 microPa; (3) the fact that 200–205 dB isopleths would be well within 100 m (328 ft) of the vessel even in shallow water; and (4) the likelihood that marine mammal detection ability by trained observers is close to 100 percent during daytime and remains high at night to that distance from the seismic vessel. As a result, no take by injury or death is anticipated, and the potential for temporary or permanent hearing impairment is very low and will be avoided through the incorporation of the proposed mitigation measures mentioned in this document.

While the number of potential incidental harassment takes will depend on the distribution and abundance of marine mammals in the vicinity of the survey activity, the number of potential harassment takings is estimated to be small. In addition, the proposed seismic program will not interfere with any legal subsistence hunts, since seismic operations will not be conducted in the same space and time as the hunts in subsistence whaling and sealing areas and will not adversely affect marine mammals used for subsistence purposes.

Proposed Authorization

NMFS proposes to issue an IHA to UAF for conducting a low-intensity oceanographic seismic survey in the Arctic Ocean, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. NMFS has preliminarily determined that the proposed activity would result in the harassment of small numbers of marine mammals; would have no more than a negligible impact on the affected marine mammal stocks; and would not have an unmitigable adverse impact on the availability of species or stocks for subsistence uses.

Information Solicited

NMFS requests interested persons to submit comments and information concerning this request (see **ADDRESSES**).

Dated: May 4, 2005.

Michael Payne,

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

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COMMITTEE FOR THE IMPLEMENTATION OF TEXTILE AGREEMENTS

Request for Public Comment on Commercial Availability Request under the United States-Singapore Free Trade Agreement (USSFTA)

May 4, 2005.

AGENCY: The Committee for the Implementation of Textile Agreements (CITA).

ACTION: Request for Public Comments concerning a request for modifications of the USSFTA rules of origin for apparel items made from certain yarns and fabrics.

SUMMARY: The Government of the United States has received a request dated April 8, 2005, from the Government of Singapore for consultations under Article 3.18.4(a)(i) of the USSFTA. Singapore is seeking agreement to revise the rules of origin for certain apparel goods to address availability of supply of certain yarns and fabrics in the territories of the Parties. The request covers products that have been the subject of prior