Dated: April 3, 2003.

Bob Castaneda,

Forest Supervisor, Kootenai National Forest.

[FR Doc. 03–8988 Filed 4–11–03; 8:45 am]

BILLING CODE 3410–11–M

DEPARTMENT OF AGRICULTURE

Forest Service

Trinity County Resource Advisory Committee

AGENCY: Forest Service, USDA.

ACTION: Notice of meeting.

SUMMARY: The Trinity County Resource Advisory Committee (RAC) will meet on May 5, 2003 in Weaverville, California. The purpose of the meeting is to discuss the selection of Title II projects under Public Law 106–393, H.R. 2389, the Secure Rural Schools and Community Self-Determination Act of 2000, also called the ''Payments to States'' Act.

DATES: The meeting will be held on May 5, 2003 from 6:30 to 8:30 p.m.

ADDRESSES: The meeting will be held at the Trinity County Office of Education Conference Room, 201 Memorial Drive, Weaverville, California.

FOR FURTHER INFORMATION CONTACT: Ann Garland, Designated Federal Official, USDA, Six Rivers National Forest, PO Box 68, Willow Creek, CA 95573. Phone: (530) 629–2118. Email: *agarland@fs.fed.us.*

SUPPLEMENTARY INFORMATION: The committee will discuss proposed fuels reduction, watershed restoration, and public project. The meeting is open to the public. Public input opportunity will be provided and individuals will have the opportunity to address the committee at that time.

Dated: April 7, 2003.

S.E. 'Lou' Woltering,

Forest Servisor.

[FR Doc. 03–9016 Filed 4–11–03; 8:45 am]

BILLING CODE 3410–11–M

DEPARTMENT OF AGRICULTURE

National Agricultural Statistics Service

Notice of Intent To Seek Reinstatement of an Information Collection

AGENCY: National Agricultural Statistics Service, USDA.

ACTION: Notice and request for comments.

SUMMARY: In accordance with the Paperwork Reduction Act of 1995 (Pub. L. 104–13) and Office of Management and Budget regulations at 5 CFR part 1320 (60 FR 44978, August 29, 1995), this notice announces the intention of the National Agricultural Statistics Service (NASS) to seek approval for reinstatement of an information collection, the Farm and Ranch Irrigation Survey.

DATES: Comments on this notice must be received by June 18, 2003, to be assured of consideration.

ADDRESSES: Comments may be mailed to Ginny McBride, NASS Information Collection Clearance Officer, U.S. Department of Agriculture, Room 5336 South Building, 1400 Independence Avenue, SW., Washington, DC 20250–2024 or sent electronically to *gmcbride@nass.usda.gov.*

FOR FURTHER INFORMATION CONTACT: Carol House, Associate Administrator, National Agricultural Statistics Service, U.S. Department of Agriculture, (202) 720–4333.

SUPPLEMENTARY INFORMATION:

Title: Farm and Ranch Irrigation Survey.

OMB Control Number: 0535—0234.

Type of Request: Intent to Seek Approval to Reinstate an Information Collection.

Abstract: The Farm and Ranch Irrigation Survey is conducted every 5 years as authorized by the Census of Agriculture Act of 1997 (Pub. L. No. 105–113). The 2003 Farm and Ranch Irrigation Survey will use a probability sample from farms that reported irrigation on the 2002 Census of Agriculture. This irrigation survey will provide a comprehensive inventory of farm irrigation practices with detailed data relating to acres irrigated by category of land use, acres and yields of irrigated and non-irrigated crops, quantity of water applied, and method of application to selected crops. Also included will be 2003 expenditures for maintenance and repair of irrigation equipment and facilities; purchase of energy for on-farm pumping of irrigation water; investment in irrigation equipment, facilities, and land improvement; and cost of water received from off-farm water supplies. Irrigation data are used by the farmers, their representatives, government agencies, and many other groups concerned with the irrigation industry. This survey will provide the only source of dependable, comparable irrigation data by State. The National Agricultural Statistics Service will use the information collected only for statistical purposes and will publish the data only as tabulated totals.

Estimate of Burden: Public reporting burden for this collection of information is estimated to average 30 minutes per response.

Respondents: Farms.

Estimated Number of Respondents: 25,000.

Estimated Total Annual Burden on Respondents: 12,500 hours.

Copies of this information collection and related instructions can be obtained without charge from Ginny McBride, NASS Information Collection Clearance Officer, at (202) 720–5778.

Comments are invited on: (a) Whether the proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information will have practical utility; (b) the accuracy of the agency's estimate of the burden of the proposed collection of information including the validity of the methodology and assumptions used; (c) ways to enhance the quality, utility, and clarity of the information to be collected; and (d) ways to minimize the burden of the collection of information on those who are to respond, including through the use of appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology.

All responses to this notice will become a matter of public record and be summarized in the request for OMB approval.

Signed in Washington, DC, March 24, 2003.

Carol House,

Associate Administrator.

[FR Doc. 03–9039 Filed 4–11–03; 8:45 am]

BILLING CODE 3410–20–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[I.D. 021203A]

Small Takes of Marine Mammals Incidental to Specified Activities; Oceanographic Surveys in the Hess Deep, Eastern Equatorial Pacific Ocean

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

ACTION: Notice of receipt of application and proposed authorization for a small take exemption; request for comments.

SUMMARY: NMFS has received an application from the Lamont-Doherty Earth Observatory (LDEO) for an Incidental Harassment Authorization (IHA) to take small numbers of marine

mammals, by harassment, incidental to conducting oceanographic surveys in the Hess Deep in international waters of the Eastern Equatorial Pacific Ocean. Under the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue a small take authorization to LDEO to incidentally take, by harassment, small numbers of several species of cetaceans and pinnipeds for a limited period of time within the next year.

DATES: Comments and information must be received no later than May 14, 2003.

ADDRESSES: Comments on the application should be addressed to Chief, Marine Mammal Conservation 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. A copy of the application, Environmental Assessment (EA) and/or a list of the references used in this document may be obtained by writing to this address or by telephoning the contact listed here. Comments cannot be accepted if submitted via e-mail or the Internet.

FOR FURTHER INFORMATION CONTACT: Kenneth R. Hollingshead, Office of Protected Resources, NMFS, (301) 713–2055, ext 128,

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) directs 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.

Permission may be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for 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.''

Subsection 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. 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; 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.
>
> (B) The term ''Level A harassment'' means harassment described in subparagraph (A)(i).
>
> (C) The term ''Level B harassment'' means harassment described in subparagraph (A)(ii).

Subsection 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 small numbers 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 January 29, 2003, NMFS received an application from LDEO for the taking, by harassment of several species of marine mammals incidental to conducting a seismic survey program in the Hess Deep portion of the Eastern Equatorial Pacific Ocean about 600 nautical miles (nm)(690 land miles; 1111.2 km) west of the Galapagos Islands during March and April 2003, but rescheduled for July, 2003. The purpose of this survey is to obtain information on movements of the earth's plates and on formations associated with those movements. More specifically, the Hess Deep survey will obtain information on the geologic nature of boundaries of the earth's crust at fast-spreading and intermediate-spreading ridges at the boundaries of tectonic plates. Past studies have mapped these areas using manned submersibles and remotely piloted vehicles, but they have not provided a link between geologic and seismic structure. This study will provide the seismic data to assess the geologic nature of the previously mapped areas.

Description of the Activity

The seismic survey will involve a single vessel, the *R/V Maurice Ewing*, which will deploy and retrieve the Ocean Bottom Seismometers (OBSs) and conduct the seismic work. The Maurice Ewing will deploy an array of airguns as an energy source, plus a 6–km (3.2–nm) towed streamer containing hydrophones to receive the returning acoustic signals.

All planned geophysical data acquisition activities will be conducted by LDEO scientists, with the participation of scientists from the University of Texas at Austin, TX. Water depths in the Hess Deep survey area will range from approximately 2,000 to 3,400 m (6,560 to 11,150 ft). A total of 912 km (492 nm) of MCS (Multi Channel Seismic) surveys using a 10–gun array and 189 km (102 nm) of OBS surveys using a 12–gun array are planned to be conducted. These line-kilometer figures represent the planned production surveys. There will be additional operations associated with equipment testing, startup, line changes, and repeat coverage of any areas where initial data quality is sub-standard.

The procedures to be used for the 2003 seismic survey will be similar to those used during previous seismic surveys by LDEO, e.g., in the equatorial Pacific Ocean (Carbotte *et al.*, 1998, 2000). The proposed program will use conventional seismic methodology with a towed airgun array as the energy source and a towed streamer containing hydrophones as the receiver system, sometimes in combination with OBS receivers placed on the bottom. The energy to the airgun array is compressed air supplied by compressors on board the source vessel. The specific configuration of the airgun array will differ between the OBS and MCS surveys, as described later in this document. In addition, a multi-beam bathymetric sonar will be operated from the source vessel at most times during the Hess Deep survey. A lower-energy sub-bottom profiler, which is routinely operated at the same time as the multi-beam sonar during other projects, will not be operated during this cruise.

The *R/V Maurice Ewing* will be used as the source vessel. It will tow the airgun array (either 10 or 12 guns) and a streamer containing hydrophones along predetermined lines. The vessel will travel at 4–5 knots (7.4–9.3 km/hr), and seismic pulses will be emitted at intervals of 60–90 seconds (OBS lines) and approximately 20 seconds (all other lines). The 20–sec spacing corresponds to a shot interval of about 50 m (164 ft). The 60–90 sec spacing along OBS lines is to minimize previous shot noise during OBS data acquisition, and the exact spacing will depend on water depth. The 10–gun array will be used during MSC surveys and the 12–gun array will be used during OBS surveys. The airguns will be widely spaced in an approximate rectangle with dimensions 35 m (114.9 ft)(across track) by 9 m (29.5 ft)(along track). Individual airguns range

in size from 80 to 850 in3, with total volumes of the arrays being 3005 and 3721 in3 for the 10– and 12–gun arrays, respectively.

The 10–airgun array will have a peak sound source level of 248 dB re 1 µPa or 255 dB peak-to-peak (P-P). The 12–airgun array will have a peak sound source level of 250 dB re 1 µPa or 257 dB P-P. These are the nominal source levels for the sound directed downward, and represent the theoretical source level close to a single point source emitting the same sound as that emitted by the array of 10 or 12 sources. Because the actual source is a distributed sound source (10 or 12 guns) rather than a single point source, the highest sound levels measurable at any location in the water will be less than the nominal source level. Also, because of the downward directional nature of the sound from these airgun arrays, the effective source level for sound propagating in near-horizontal directions will be substantially lower.

Along selected lines, OBSs will be positioned by the *R/V Maurice Ewing* prior to the time when it begins airgun operations in that area. After OBS lines are shot, the R/V Maurice Ewing will retrieve the OBSs, download the data, and refurbish the units.

Along with the airgun operations, one additional acoustical data acquisition activity will occur throughout most of the cruise. The ocean floor will be mapped with an Atlas Hydrosweep DS–2 multi-beam 15.5–kHz bathymetric sonar. The Atlas Hydrosweep is mounted in the hull of the *R/V Maurice Ewing*, and it operates in three modes, depending on the water depth. The first mode is when water depth is <400 m (1312.3 ft). The source output is 210 dB re 1 µPa-m rms and a single 1–millisec pulse or ''ping'' per second is transmitted, with a beamwidth of 2.67 degrees fore-aft and 90 degrees in beamwidth. The beamwidth is measured to the 3 dB point, as is usually quoted for sonars. The other two modes are deep-water modes: The Omni mode is identical to the shallow-water mode except that the source output is 220 dB rms. The Omni mode is normally used only during start up. The Rotational Directional Transmission (RDT) mode is normally used during deep-water operation and has a 237 dB rms source output. In the RDT mode, each ''ping'' consists of five successive transmissions, each ensonifying a beam that extends 2.67 degrees fore-aft and approximately 30 degrees in the cross-track direction. The five successive transmissions (segments) sweep from port to starboard with minor overlap, spanning an overall cross-track angular extent of about 140 degrees, with tiny (<1 millisec) gaps between the pulses for successive 30–degree segments. The total duration of the ''ping'', including all 5 successive segments, varies with water depth but is 1 millisec in water depths >500 m (1640.4 ft) and 10 millisec in the deepest water. Additional information on the airgun array and Atlas Hydrosweep specifications is contained in the application, which is available upon request (see **ADDRESSES**).

Description of Habitat and Marine Mammals Affected by the Activity

A detailed description of the Eastern Equatorial Pacific Ocean and its associated marine mammals can be found in a number of documents referenced in the LDEO application and is not repeated here. Approximately 27 species of cetaceans and possibly two species of pinnipeds may inhabit the area of the Hess Deep. These species are the sperm whale (*Physeter macrocephalus*), pygmy sperm whale (*Kogia breviceps*), dwarf sperm whale (*Kogia sima*), Cuvier's beaked whale (*Ziphius cavirostris*), Longman's beaked whale (*Indopacetus pacificus*), pygmy beaked whale (*Mesoplodon peruvianus*), Ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*), Blainville's beaked whale (*Mesoplodon densirostris*), rough-toothed dolphin (*Steno bredanensis*), bottlenose dolphin (*Tursiops truncatus*), pantropical spotted dolphin (*Stenella attenuata*), spinner dolphin (Stenella longirostris), striped dolphin (*Stenella coeruleoalba*), short-beaked common dolphin (*Delphinus delphis*), Fraser's dolphin (*Lagenodelphis hosei*), Risso's dolphin (*Grampus griseus*), melon-headed whale (*Peponocephala electra*), pygmy killer whale (*Feresa attenuata*), false killer whale (*Pseudorca crassidens*), killer whale (*Orcinus orca*), short-finned pilot whale (*Globicephala macrorhynchus*), humpback whale (*Megaptera novaeangliae*), minke whale (*Balaenoptera acutorostrata*), Bryde's whale (*Balaenoptera edeni*), sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*), and the blue whale (*Balaenoptera musculus*), Galapagos fur seal (*Arctocephalus galapagoensis*) and Galapagos sea lion (*Zalophus wollebaeki*). Additional information on most of these species is contained in Caretta *et al.* (2001, 2002) which is available at: *http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/sars.html.*

Potential Effects on Marine Mammals

As outlined in several previous NMFS documents, 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 (as are vehicle launches), 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). 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.

Characteristics of Airgun Pulses

Airguns function by venting high-pressure air into the water. The pressure signature of an individual airgun consists of a sharp rise and then fall in pressure, followed by several positive and negative pressure excursions caused by oscillation of the resulting air bubble. The sizes, arrangement and firing times of the individual airguns in an array are designed and synchronized to suppress the pressure oscillations subsequent to the first cycle. The resulting downward-directed pulse has a duration of only 10 to 20 ms, with only one strong positive and one strong negative peak pressure (Caldwell and Dragoset, 2000). Most energy emitted from airguns is at relatively low frequencies. For example, typical high-energy airgun arrays emit most energy at 10–120 Hz. However, the pulses contain some energy up to 500–1000 Hz and above (Goold and Fish, 1998). The pulsed sounds associated with seismic exploration have higher peak levels than other industrial sounds to which whales and other marine mammals are routinely exposed. The P-P source levels of the 20–gun array (not proposed to be used for the Hess Deep work), and the 12–gun array and 10–gun arrays (that will be used for the Hess Deep), are 262, 257, and 255 dB re 1 µPa-m, respectively. These are the nominal source levels applicable to downward propagation. (The effective source level for horizontal propagation is lower.) The only sources with higher or comparable effective source levels are explosions and high-power sonars operating near maximum power.

Several important mitigating factors need to be kept in mind. (1) Airgun arrays produce intermittent sounds, involving emission of a strong sound pulse for a small fraction of a second followed by several seconds of near silence. In contrast, some other acoustic sources produce sounds with lower peak levels, but their sounds are continuous or discontinuous but continuing for much longer durations than seismic pulses. (2) Airgun arrays are designed to transmit strong sounds downward through the seafloor, and the amount of sound transmitted in near-horizontal directions is considerably reduced. Nonetheless, they also emit sounds that travel horizontally toward non-target areas. (3) An airgun array is a distributed source, not a point source. The nominal source level is an estimate of the sound that would be measured from a theoretical point source emitting the same total energy as the airgun array. That figure is useful in calculating the expected received levels in the far field (i.e., at moderate and long distances). Because the airgun array is not a single point source, there is no one location within the near field (or anywhere else) where the received level is as high as the nominal source level.

The strengths of airgun pulses can be measured in different ways, and it is important to know which method is being used when interpreting quoted source or received levels. Geophysicists usually quote P-P levels, in bar-meters or dB re 1 µPa-m. The peak (= zero-to-peak) level for the same pulse is typically about 6 dB less. In the biological literature, levels of received airgun pulses are often described based on the ''average'' or ''root-mean-square'' (rms) level over the duration of the pulse. The rms value for a given pulse is typically about 10 dB lower than the peak level, and 16 dB lower than the P-P value (Greene, 1997; McCauley *et al.*, 1998, 2000a). A fourth measure that is sometimes used is the energy level, in dB re 1 μPa^2s. Because the pulses are >1 sec in duration, the numerical value of the energy is lower than the rms pressure level (but the units are different). Because the level of a given pulse will differ substantially depending on which of these measures is being applied, it is important to be aware which measure is in use when interpreting any quoted pulse level. In the past, NMFS has commonly referenced the rms levels when discussing levels of pulsed sounds that might ''harass'' marine mammals.

Seismic sound received at any given point will arrive via a direct path, indirect paths that include reflection from the sea surface and bottom, and often indirect paths including segments through the bottom sediments. Sounds propagating via indirect paths travel longer distances and often arrive later than sounds arriving via a direct path. (However, sound travel in the bottom may travel faster than that in the water, and thus may arrive earlier than the direct arrival despite traveling a greater distance.) These variations in travel time have the effect of lengthening the duration of the received pulse. At the source, seismic pulses are about 10 to 20 ms in duration. In comparison, the pulse duration as received at long horizontal distances can be much greater. For example, for one airgun array operating in the Beaufort Sea, pulse duration was about 300 ms at a distance of 8 km (4.3 nm), 500 ms at 20 km (10.8 nm), and 850 ms at 73 km (39.4 nm) (Greene and Richardson, 1988).

Another important aspect of sound propagation is that received levels of low-frequency underwater sounds diminish close to the surface because of pressure-release and interference phenomena that occur at and near the surface (Urick, 1983; Richardson *et al.*, 1995). Paired measurements of received airgun sounds at depths of 3 m (9.8 ft) vs. 9 or 18 m (29.5 or 59 ft) have shown that received levels are typically several decibels lower at 3 m (9.8. ft)(Greene and Richardson, 1988). For a mammal whose auditory organs are within 1/2 or 1 m (1.6 or 3.3 ft) of the surface, the received level of the predominant low-frequency components of the airgun pulses would be further reduced.

Pulses of underwater sound from open-water seismic exploration are often detected 50 to 100 km (30 to 54 nm) from the source location, even during operations in nearshore waters (Greene and Richardson, 1988; Burgess and Greene, 1999). At those distances, the received levels on an approximate rms basis are low (below 120 dB re 1 mPa). However, faint seismic pulses are sometimes detectable at even greater ranges (e.g., Bowles *et al.*, 1994; Fox *et al.*, 2002). Considerably higher levels can occur at distances out to several kms from an operating airgun array. With 12–gun and 10–gun arrays, the distances at which seismic pulses are expected to diminish to received levels of 190, 180, 170 dB and 160 dB re 1 µPa, on an rms basis) are as follows:

Airgun Array	RMS Radii (m/ft)			
	190 dB	180 dB	170 dB	160 dB
12 airguns	300/984	880/2887	2680/8793	7250/23786
10 airguns	250/820	830/2723	2330/7644	6500/21325

Additional information can be found in the LDEO application.

Effects of Seismic Surveys on Marine Mammals

The LDEO application provides the following information on what is known about the effects, on marine mammals, of the types of seismic operations planned by LDEO. The types of effects considered here are (1) masking, (2) disturbance, and (3) potential hearing impairment and other physical effects. Additional discussion on species specific effects can be found in the LDEO application.

Masking

Masking effects on marine mammal calls and other natural sounds are expected to be limited. Seismic sounds are short pulses occurring for less than 1 sec every 20 or 60–90 sec in this project. Sounds from the multibeam sonar are very short pulses, occurring for 1–10 msec once every 1 to 15 sec, depending on water depth. (During operations in deep water, the duration of each pulse from the multibeam sonar as received at any one location would actually be only 1/5th or at most 2/5th of 1–10 msec, given the segmented nature of the pulses.) 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). 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 recent study reports that sperm whales continued calling in the presence of seismic pulses (Madsen *et al.*, 2002). Masking effects of seismic pulses are expected to be negligible in the case of the smaller odontocete cetaceans, given the intermittent nature of seismic pulses plus the fact that sounds important to them are predominantly at much higher frequencies than are airgun sounds.

Most of the energy in the sound pulses emitted by airgun arrays is at low frequencies, with strongest spectrum levels below 200 Hz and considerably lower spectrum levels above 1000 Hz. These frequencies are mainly used by mysticetes, but 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 cetacean signal. If little or no overlap occurs between the industrial noise and the frequencies used, as in the case of many marine mammals vs. 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; reviewed in Richardson *et al.*, 1995:233*ff*, 364*ff*). 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 and preadaptation to tolerate some masking by natural sounds (Richardson *et al.*, 1995), would all reduce the importance of masking.

Disturbance by Seismic Surveys

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous dramatic changes in activities, and displacement. Disturbance is the primary concern for this project. Based on previous determinations by NMFS regarding minor behavioral response by marine mammals, LDEO presumes here that simple exposure to sound, or brief reactions that do not disrupt behavioral patterns in a potentially significant manner, do not constitute Level B harassment or ''taking''. By potentially significant, LDEO means ''in a manner that might have deleterious effects to the well-being of individual marine mammals or their populations.''

However, there are difficulties in defining which marine mammals should be counted as ''taken by harassment''. For many species and situations, scientists do not have detailed information about their reactions to noise, including reactions to seismic (and sonar) pulses. Behavioral reactions of marine mammals to sound are difficult to predict. Reactions to sound, if any, depend on species, state of maturity, experience, current activity, reproductive state, time of day, 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 be significant to the individual let alone the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on the animals could be significant. Given the many uncertainties in predicting the quantity and types of impacts of noise on marine mammals, scientists often resort to estimating how many mammals were present within a particular distance of industrial activities, or exposed to a particular level of industrial sound. This likely overestimates the numbers of marine mammals that are affected in some biologically important manner. The sound criteria used to estimate how many marine mammals might be disturbed to some biologically-important degree by a seismic program are based on behavioral observations during studies of several species. However, information is lacking for many other species. This is discussed further in the LDEO application.

Hearing Impairment and Other Physical Effects

Temporary or permanent hearing impairment is a possibility when marine mammals are exposed to very strong sounds. 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 temporary threshold shift (TTS). The level associated with the onset of TTS is often considered to be a level below which there is no danger of damage. Current NMFS policy regarding exposure of marine mammals to high-level sounds is that cetaceans and pinnipeds should not be exposed to impulsive sounds exceeding 180 and 190 dB re 1 micro Pa (rms), respectively.

Several aspects of the planned monitoring and mitigation measures for this project are designed to detect marine mammals occurring near the airgun array (and multi-beam sonar), and to avoid exposing them to sound pulses that might cause hearing impairment. In addition, many cetaceans are likely to show some avoidance of the area with ongoing seismic operations. In these cases, the avoidance responses of the animals themselves will reduce or avoid the possibility of hearing impairment.

Non-auditory physical effects may also occur in marine mammals exposed to strong underwater pulsed sound. Possible types of non-auditory physiological effects or injuries that might (in theory) occur 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.

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. The magnitude of TTS depends on the level and duration of noise exposure, among other considerations (Richardson *et al.*, 1995). For sound exposures at or somewhat above the TTS threshold, hearing sensitivity recovers rapidly after exposure to the noise ends. Only a few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals.

Currently, NMFS believes that, whenever possible to avoid Level A harassment, cetaceans should not be exposed to pulsed underwater noise at received levels exceeding 180 dB re 1 µPa (rms). The corresponding limit for pinnipeds has been set at 190 dB. The predicted 180- and 190–dB distances for the airgun arrays operated by LDEO during this activity were summarized previously in this document. These sound levels are not considered to be the levels at or above which TTS might occur. Rather, they are the received levels above which, in the view of a panel of bioacoustics specialists convened by NMFS, one cannot be certain that there will be no injurious effects, auditory or otherwise, to marine mammals. It has 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. 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 airgun arrays, which has become standard operational protocol for many seismic operators including LDEO, should allow cetaceans to move away from the seismic source and to avoid being exposed to the full acoustic output of the airgun array.

Permanent Threshold Shift (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. Physical damage to a mammal's hearing apparatus can 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 do not cause permanent auditory damage in terrestrial mammals, and presumably do not do so in marine 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). In terrestrial mammals, the received sound level from a single sound exposure must be far above the TTS threshold for any risk of permanent hearing damage (Kryter, 1994; Richardson *et al.*, 1995). 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.

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 exposure to a series of seismic pulses may be on the order of 220 dB re 1 µPa (P-P) in odontocetes, then the PTS threshold might be about 240 dB re 1 µPa (P-P). 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.*, 1995:137; Caldwell and Dragoset, 2000). 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. 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. However, pinnipeds are expected to be (at most) uncommon in the Hess Deep survey area. Although it is unlikely that the planned seismic surveys could cause PTS in any marine mammals, caution is warranted given the limited knowledge about noise-induced hearing damage in marine mammals, particularly baleen whales.

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, and there is no evidence that they can cause serious injury, death, or stranding. However, the association of mass strandings of beaked whales with naval exercises and, in a recent case, an LDEO seismic survey has raised the possibility that beaked whales may be especially susceptible to injury and/or stranding when exposed to strong pulsed sounds.

In March 2000, several beaked whales that had been exposed to repeated pulses from high intensity, mid-frequency military sonars stranded and died in the Providence Channels of the Bahamas Islands, and were subsequently found to have incurred cranial and ear damage (NOAA and USN, 2001). Based on post-mortem analyses, it was concluded that an acoustic event caused hemorrhages in and near the auditory region of some beaked whales. These hemorrhages occurred before death. They would not necessarily have caused death or permanent hearing damage, but could have compromised hearing and navigational ability (NOAA and USN, 2001). The researchers concluded that acoustic exposure caused this damage and triggered stranding, which resulted in overheating, cardiovascular collapse, and physiological shock that ultimately

led to the death of the stranded beaked whales. During the event, five naval vessels used their AN/SQS–53C or –56 hull-mounted active sonars for a period of 16 h. The sonars produced narrow (<100 Hz) bandwidth signals at center frequencies of 2.6 and 3.3 kHz (–53C), and 6.8 to 8.2 kHz (-56). The respective source levels were usually 235 and 223 dB re 1 μ Pa, but the -53C briefly operated at an unstated but substantially higher source level. The unusual bathymetry and constricted channel where the strandings occurred were conducive to channeling sound. This, and the extended operations by multiple sonars, apparently prevented escape of the animals to the open sea. In addition to the strandings, there are reports that beaked whales were no longer present in the Providence Channel region after the event, suggesting that other beaked whales either abandoned the area or (perhaps) died at sea (Balcomb and Claridge, 2001).

Other strandings of beaked whales associated with operation of military sonars have also been reported (*e.g.,* Simmonds and Lopez-Jurado, 1991; Frantzis, 1998). In these cases, it was not determined whether there were noise-induced injuries to the ears or other organs. Another stranding of beaked whales (15 whales) happened on 24–25 September 2002 in the Canary Islands, where naval maneuvers were taking place.

It is important to note that seismic pulses and mid-frequency 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 the sonar-related strandings, there was a recent (September 2002) stranding of two Cuvier's beaked whales in the Gulf of California (Mexico) when a seismic survey by the National Science Foundation/LDEO vessel *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 to this date 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, as discussed later in this document, 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 plus 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.

Non-auditory Physiological Effects

Possible types of non-auditory physiological effects or injuries that might occur in marine mammals exposed to strong underwater sound might, in theory, include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. There is no proof 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 mightbe 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. This is particularly so in the case of broad-scale seismic surveys of the type planned by LDEO (see Fig. 1 in LDEO (2003)), where the tracklines are generally not as closely spaced as in many 3–dimensional industry surveys.

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. Diving marine mammals are not subject to the bends or air embolism because, unlike a human SCUBA diver, they only breath air at sea level pressure and have protective adaptations against getting the bends. There may 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).

A recent workshop (Gentry (ed.), 2002) was held 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.

In summary, little is known about the potential for seismic survey sounds to cause auditory impairment or other physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would be limited to situations where the marine mm where the marine mammal is located at a short distance 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.

Possible Effects of Mid-Frequency Sonar Signals

A multi-beam bathymetric sonar (Atlas Hydrosweep DS–2, 15.5–kHz) will be operated from the source vessel at most times during the Hess Deep survey. Sounds from the multibeam sonar are very short pulses, occurring for 1–10 msec once every 1 to 15 sec, depending on water depth. Most of the energy in the sound pulses emitted by this multi-beam sonar is at high frequencies, centered at 15.5 kHz. The beam is narrow (2.67°) in fore-aft extent, and wide (140°) in the cross-track extent. Each ping consists of five successive transmissions (segments) at different cross-track angles. Any given mammal at depth near the trackline would be in the main beam for only one or two of the five segments, i.e. for 1/5th or at most 2/5th of the 1– 10 msec.

Navy sonars that have been linked to avoidance reactions and stranding of cetaceans (1) generally are more powerful than the Atlas Hydrosweep, (2) have a longer pulse duration, and (3) are directed close to horizontally (vs. downward for the Hydrosweep). The area of possible influence of the Hydrosweep is much smaller (a narrow band below the source vessel). Marine mammals that encounter the Hydrosweep 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 limited amounts of pulse energy because of the short pulses.

Masking by Mid-Frequency Sonar Signals

There is little chance that marine mammal communications will be masked appreciably by the multibeam sonar signals given the low duty cycle of the sonar and the brief period when an individual mammal is likely to be within its beam. Furthermore, in the case of baleen whales, the sonar signals do not overlap with the predominant frequencies in the calls, which would avoid significant masking.

Behavioral Responses Resulting from Mid-Frequency Sonar Signals

Marine mammal behavioral reactions to military and other sonars appear to vary by species and circumstance. Sperm whales reacted to military sonar, apparently from a submarine, by dispersing from social aggregations, moving away from the sound source, remaining relatively silent and becoming difficult to approach (Watkins *et al.*, 1985). Other early and generally limited observations were summarized in Richardson *et al.* (1995, p. 301*ff*). More recently, Rendell and Gordon (1999) recorded vocal behavior of pilot whales during periods of active naval sonar transmission. The sonar signal was made up of several components each lasting 0.17 sec and sweeping up from 4 to 5 kHz. The pilot whales were significantly more vocal while the pulse trios were being emitted than during the intervening quiet periods, but did not leave the area even after several hours of exposure to the sonar.

Reactions of beaked whales near the Bahamas to mid-frequency naval sonars were summarized earlier. Following extended exposure to pulses from a variety of ships, some individuals beached themselves, and others may have abandoned the area (Balcomb and Claridge, 2001; NOAA and USN, 2001). Pulse durations from these sonars were much longer than those of the LDEO multi-beam sonar, and a given mammal would probably receive many pulses. All of these observations are of limited relevance to the present situation because exposures to multi-beam pulses are expected to be brief as the vessel passes by, and the individual pulses will be very short.

Captive bottlenose dolphins and a white whale exhibited changes in behavior when exposed to 1 sec pulsed sounds at frequencies similar to those that will be emitted by the multi-beam sonar used by LDEO (Ridgway *et al.*, 1997; Schlundt et al., 2000), and to shorter broadband pulsed signals (Finneran *et al.*, 2000, 2002). Behavioral changes typically involved what appeared to be deliberate attempts to avoid the sound exposure or to avoid the location of the exposure site during subsequent tests (Schlundt *et al.*, 2000; Finneran *et al.*, 2002). Dolphins exposed to 1–sec intense tones exhibited short-term changes in behavior above received sound levels of 178 to 193 dB re 1 μPa rms and belugas did so at received levels of 180 to 196 dB and above. Received levels necessary to elicit such reactions to shorter pulses were higher (Finneran *et al.*, 2000, 2002). Test animals sometimes vocalized after exposure to pulsed, mid-frequency sound from a watergun (Finneran *et al.*, 2002). In some instances, animals exhibited aggressive behavior toward the test apparatus (Ridgway et al., 1997; Schlundt et al., 2000). The relevance of these data to free-ranging odontocetes is uncertain. In the wild, cetaceans sometimes avoid sound sources well before they are exposed to the levels listed above, and reactions in the wild may be more subtle than those described by Ridgway *et al.* (1997) and Schlundt *et al.*(2000).

LDEO is not aware of any data on the reactions of pinnipeds to sonar sounds, although it is likely the pinniped species can detect these sounds given their hearing abilities (Kastak and Schusterman, 1995, 1998, 1999; see also a review in Richardson *et al.*, 1995). Some harp seals (*Pagophilus groenlandicus*) seemed to alter their swimming patterns (exhibited avoidance) when they were exposed to the beam of an echosounder, nominally operating at 200 kHz (Terhune, 1976); that frequency is above the range of effective hearing of seals. However, there was significant energy at lower frequencies that would be audible to a harp seal (Richardson et al., 1995). The behavior of ringed (*Phoca hispida*) and Weddell (*Leptonychotes weddelli*) seals fitted with acoustic pingers, transmitting at 60 to 69 kHz, did not seem to be affected by the sounds from these devices. Mate (1993) described experiments where aperiodic 12–17 kHz sound pulses of varying duration were effective, at source levels of 187 dB, in reducing harbor seal abundance near fish hatcheries (although a few older seals may have habituated and foraged nearby with modified techniques such that they were not seen as frequently). For California sea lions, the same system produced a dramatic initial startle response but was otherwise ineffective. Mate (1993) noted that many marine mammals will react to moving sound sources even if strong stationary sources are tolerated. Mate also noted that, by not using swept frequencies, this experimental acoustic source lost the illusion of motion that would have been simulated by Doppler-like frequency sweeps.

In summary, cetacean behavioral reactions to military and other sonars appear to vary by species and circumstance. While there may be a link between naval sonar use and changes in cetacean vocalization rates and movements, it is unclear what impact these behavioral changes (which are likely to be short-term) might have on the animals. Data on the reactions of pinnipeds to sonar sounds are lacking, but the few reports available on their reactions to other pulsed sounds suggest that they too would exhibit either no, or short-term, behavioral responses. Therefore, as mentioned previously, because simple momentary behavioral reactions that are within normal behavioral patterns for that species are not considered to be a taking, the very brief exposure of cetaceans to signals from the Hydrosweep is unlikely to result in a ''take'' by harassment.

Hearing Impairment and Other Physical Effects

Given recent stranding events that have been associated with the operation of naval sonar, there is much concern that sonar noise can cause serious impacts to marine mammals (for discussion see Effects of Seismic Surveys). It is worth noting that the multi-beam sonar proposed for use by LDEO is quite different than sonars used for navy operations. Pulse duration of the multi-beam sonar 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 beamwidth. (Navy sonars often use near-horizontally-directed sound.) These factors would all reduce the sound energy received from the multi-beam sonar rather drastically relative to that from the sonars used by the Navy.

Estimates of Take by Harassment for the Hess Deep Cruise

As described previously in this document and in the LDEO application, animals subjected to sound levels above 160 dB may alter their behavior or distribution, and therefore might be considered to be taken by Level B harassment. However, the 160 dB criterion is based on studies of baleen whales. Odontocete hearing at low frequencies is relatively insensitive, and the dolphins generally appear to be more tolerant of strong sounds than are most baleen whales. For that reason, it has been suggested that for purposes of estimating incidental harassment of odontocetes, a 170 dB criterion might be appropriate.

Based on summer marine mammal survey data collected by NMFS and density calculations by Ferguson and Barlow (2001), LDEO used their average marine mammal density to compute a ''best estimate'' of the number of marine mammals that may be exposed to seismic sounds ≥160 dB re 1μPa (rms). The average densities were then multiplied by the proposed survey effort (912 and 189 km for the 10–gun and 12–gun array, respectively) and twice the 160 dB radius from the source vessel (the 160 dB radius was 6.5 and 7.25 km for the 10–gun and 12–gun array, respectively) to estimate the ''best estimate'' of the numbers of animals that might be exposed to sound levels ≥160 dB re 1μPa (rms) during the proposed seismic survey program. Separate estimates were made for the 10–gun and 12–gun arrays because the 160 dB radius was different for the two arrays (see Tables 5 and 6 in LDEO (2003)). Based on this method, the ''best estimate'' of the number of marine mammals that would be exposed to ≥160 dB (rms) and thus potentially taken by Level B harassment during the proposed survey is 8,901, including animals taken by both the 10–gun and 12–gun arrays. Of these, 12 animals would be endangered species, sperm whales (11) and a single blue whale. The species composition of cetaceans within the species groups shown in Tables 5 and 6 in LDEO (2003) is expected to be roughly in proportion to the densities shown for each species in Table 3 in LDEO (2003). Based on those densities, the numbers of each species that might be taken by Level B harassment are shown in Table 7 in LDEO (2003).

Dolphins would account for 96 percent of the overall estimate for potential taking by harassment (i.e., 8,532 of 8,901). While there is no agreement regarding any alternative ''take'' criterion for dolphins exposed to airgun pulses, if only those dolphins exposed to 170 dB re 1 μPa (rms) were affected sufficiently to be considered taken by Level B harassment, then the best estimate for dolphins would be 3,076 rather than 8,532. This is based on the predicted 170–dB radius around the 10– and 12–airgun arrays (2,330 and 2,680 m (7,644 and 7,742 ft), respectively), and is considered to be a more realistic estimate of the number of dolphins that may be disturbed. Therefore, the total number of animals likely to react behaviorally is considerably lower than the 8,901 that LDEO has estimated in Tables 5 and 6 (LDEO, 2003).

Conclusions—Effects on Cetaceans

Strong avoidance reactions by several species of mysticetes to seismic vessels have been observed at ranges up to 6 to 8 km and occasionally as far as 20–30 km from the source vessel. Some bowhead whales avoided waters within 30 km of the seismic operation. However, reactions at such long distances appear to be atypical of other species of mysticetes, and even for bowheads may only apply during migration.

Odontocete reactions to seismic pulses, or at least those 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 dolphins 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 account of the mitigation measures that are planned, effects on cetaceans are generally expected to be limited to avoidance of the area around the seismic operation and short-term changes in behavior, falling within the MMPA definition of ''Level B harassment.'' In the cases of mysticetes, these reactions are expected to involve small numbers of individual cetaceans because few mysticetes occur in the areas where seismic surveys are proposed. LDEO's ''best estimate'' is that 10 Bryde's whales, or 0.1 percent of the estimated Eastern Equatorial Bryde's whale population, will be exposed to sound levels ≤160 dB re 1 μPa (rms) and potentially affected, and 1 blue whale, or 0.1 percent of the ''endangered'' ETP blue whale population, would receive >160 dB. Therefore, these potential takings by Level B harassment will have a negligible impact on their populations.

Larger numbers of odontocetes may be affected by the proposed activities, but the population sizes of the main species are large and the numbers potentially affected are small (<0.1 percent) relative to the population sizes. The total number of odontocetes that might be exposed to ≥160 dB re 1 μPa (rms) in the Hess Deep area is estimated as 8,890. Of these, 8,532 are delphinids, and of these about 3,076 might be exposed to ≥170 dB. These figures are <0.1 percent of the Eastern Equatorial populations of these combined species, and the 3,076 value (based on the >170 dB criterion) is believed to be a more accurate estimate of the number that could potentially be harassed under Level B.

The many cases of apparent tolerance by cetaceans of seismic exploration, vessel traffic, and some other human activities show that co-existence is possible. Mitigation measures such as controlled speed, look-outs, non-pursuit, ramp-ups, avoidance of start-ups during periods of darkness when possible, and shut-down when within defined ranges (See Mitigation) should further reduce short-term reactions to disturbance, and minimize any effects on hearing sensitivity.

Conclusions—Effects on Pinnipeds

Very few if any pinnipeds are expected to be encountered in the Hess Deep area. Thus a maximum of 20 pinnipeds in the Hess Deep area may be affected by the proposed seismic surveys. If pinnipeds are encountered, the proposed seismic activities would have, at most, a short-termed effect on their behavior and no long-term impacts on individual seals or their populations.

Responses of pinnipeds to acoustic disturbance are variable, but usually quite limited. Effects are expected to be limited to short-term and localized behavioral changes falling within the MMPA definition of Level B harassment.

Mitigation

For the proposed seismic operations in the Hess Deep, a 12–gun array with a total volume of 3721 in3 and a 10–gun array of 3005 in^3 will be used. The airguns comprising these arrays will be spread out horizontally, so that the energy from the array will be directed mostly downward. Modeled results for the 10– and 12–gun arrays indicate received levels to the 180 dB re 1 µPa (rms) isopleth (the criterion applicable to cetaceans) were 830 and 880 m (2,723 and 2,887 ft), respectively. The radii around the 10– and 12–gun arrays where the received level would be 190 dB re 1 µPa (rms) isopleth (lines of equal pressure), the criterion (applicable to pinnipeds), were estimated as 250 and 300 m (820 and 984 ft), respectively. Vessel-based observers will monitor marine mammals in the vicinity of the arrays. A calibration study planned for late May and/or June 2003 in the Gulf of Mexico is expected to determine the actual radii corresponding to each sound level. If the modeled radii have not been verified by the time of the Hess Deep surveys, LDEO proposes to use 1.5 times the 180– (cetaceans) and 190– (pinnipeds) dB radii predicted by the model as the safety radii until the radii have been verified. Thus, during the Hess Deep cruise the proposed safety radii for cetaceans are 1,245 and 1,320 m (4,085 and 4,331 ft), respectively, for the 10– and 12–gun arrays, and the proposed safety radii for pinnipeds are 375 and 450 m (1,230 and 1,476 ft), respectively. LDEO proposes to shut down the seismic source if marine mammals are observed within the proposed safety radii.

Also, LDEO proposes to use a ramp-up procedure when commencing operations. Ramp-up will begin with the smallest gun in the array that is being used (80 in^3 for the 10– and 12–gun arrays), and guns will be added in a sequence such that the source level of the array will increase at a rate no greater than 6 dB per 5–minutes.

Operational Mitigation

The directional nature of the two alternative airgun arrays to be used in this project is an important mitigating factor, resulting in reduced sound levels at any given horizontal distance than would be expected at that distance if the source were omnidirectional with the stated nominal source level. Also, the use of the 10– or 12–gun array of 3,005 or 3,721 in3 rather than the largest airgun array that the LDEO's source vessel can deploy (20 airguns totaling almost 8600 in3) is another significant mitigation measure.

Marine Mammal Monitoring

Vessel-based observers will monitor marine mammals near the seismic source vessel during all daylight airgun operations and during any nighttime startups of the airguns. Airgun operations will be suspended when marine mammals are observed within, or about to enter, designated safety zones where there is a possibility of significant effects on hearing or other physical effects. Vessel-based observers will watch for marine mammals near the seismic vessel during daylight periods with shooting, and for at least 30 minutes prior to the planned start of airgun operations. Observers will not be on duty during ongoing seismic operations at night; bridge personnel will watch for marine mammals during this period and will call for the airguns to be shut down if marine mammals are observed in or about to enter the safety radii. If the airguns are started up at night, two marine mammal observers will monitor marine mammals near the source vessel for 30 minutes prior to start up using night vision devices as described later (see Monitoring and Reporting).

Two observers will be stationed on the *R/V Maurice Ewing* during seismic operations in the Hess Deep area. The *R/V Maurice Ewing* is a suitable platform for marine mammal observations. The observer's eye level will be approximately 11 m (36 ft) above sea level when stationed on the bridge, allowing for good visibility within a 210° arc for each observer. The proposed monitoring plan is summarized later in this document.

Proposed Safety Radii

Received sound levels have been modeled for the 10–, 12–, and 20–air gun arrays (but the 20–gun array will not be used during the Hess Deep Project). Based on the modeling, estimates of the 190, 180, 170, and 160 dB re 1 µPa (rms) distances (safety radii) for these arrays have been provided previously in this document. Acoustic measurements in shallow and deep water will be taken, in order to check the modeled received sound levels from these arrays. This verification is expected to occur in June 2003 in the Gulf of Mexico. If verification of the safety radii does not occur before the start of the proposed program, then conservative safety radii will be used during the proposed Hess Deep seismic surveys. Conservative radii will be 1.5 times the distances indicated for the 10- and 12–airgun arrays to be used in the Hess Deep area. Thus, during the Hess Deep cruise the proposed conservative safety radii for cetaceans are 1,245 and 1,320 m (4,085 and 4,331 ft), for the 10– and 12–gun arrays, respectively, and the proposed conservative safety radii for pinnipeds are 375 and 450 m (1,230 and 1,476 ft), respectively.

Airgun operations will be suspended immediately when cetaceans are seen within or about to enter the appropriate 180–dB (rms) radius, or if pinnipeds are seen within or about to enter the 190–dB (rms) radius. These 190 and 180 dB criteria are consistent with guidelines listed for pinnipeds and cetaceans by NMFS (2000) and other guidance by NMFS.

Mitigation During Operations

The following mitigation measures, as well as marine mammal monitoring, will be adopted during the Hess Deep seismic survey program and the acoustic verification program, provided that doing so will not compromise operational safety requirements:

(1) Course alteration; (2) Shut-down procedures; and (3) Ramp-up procedures.

Course Alteration

If a marine mammal is detected outside the safety radius and, based on its position and the relative motion, is likely to enter the safety radius, alternative ship tracks will be plotted against anticipated mammal locations. The vessel's direct course and/or speed will 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 radius. If the mammal appears likely to enter the safey radius, further mitigative actions will be taken, i.e., either further course alterations or shutdown of the airguns.

Shutdown Procedures

Vessel-based observers will monitor marine mammals near the seismic vessel during daylight and for 30 minutes prior to start up during darkness throughout the program. Airgun operations will be suspended immediately when marine mammals are observed within, or about to enter, designated safety zones where there is a possibility of physical effects, including effects on hearing (based on the 180 and 190 dB criteria specified by NMFS). The

shutdown procedure should be accomplished within several seconds or one shot period of the determination that a marine mammal is within or about to enter the safety zone. Airgun operations will not resume until the marine mammal is outside the safety radius. Once the safety zone is clear of marine mammals, the observer will advise that seismic surveys can re-commence. The ''ramp-up'' procedure will then be followed.

Ramp-up Procedure

A ''ramp-up'' procedure will be followed when the airgun arrays begin operating after a specified-duration period without airgun operations. Under normal operational conditions (vessel speed 4–5 knots), a ramp-up would be required after a ''no shooting'' period lasting 2 minutes or longer. At 4 knots, the source vessel would travel 247 m (810 ft) during a 2–minute period. If the towing speed is reduced to 3 knots or less, as sometimes required when maneuvering in shallow water (not a factor in Hess Deep), it is proposed that a ramp-up would be required after a ''no shooting'' period lasting 3 minutes or longer. At towing speeds not exceeding 3 knots, the source vessel would travel no more than 277 m (909 ft) in 3 minutes. These guidelines would require modification if the normal shot interval were more than 2 or 3 min, respectively, but that is not expected to occur during the Hess Deep project.

Ramp-up will begin with the smallest gun in the array that is being used (80 in^3 for the 10– and 12–gun arrays). Guns will be added in a sequence such that the source level of the array will increase in steps not exceeding 6 dB per 5–minute period over a total duration of approximately 18–20 min (10–12 gun arrays).

Monitoring and Reporting

LDEO proposes to conduct marine mammal monitoring of its 2003 seismic program in the Hess Deep and acoustical verification of safety radii, in order to satisfy the anticipated requirements of the IHA.

Vessel-based Visual Monitoring

Two observers dedicated to marine mammal observations will be stationed aboard LDEO's seismic survey vessel for the seismic survey in the Hess Deep area. It is proposed that one or both marine mammal observers aboard the seismic vessel will search for and observe marine mammals whenever seismic operations are in progress during daylight hours. When feasible, two observers will be on duty for at least 30 minutes prior to the start of seismic shooting and during ramp-up procedures. The 30–minute observation period is only required prior to commencing seismic operations following an extended shut down period.

If ramp-up procedures must be performed at night, two observers will be on duty 30 minutes prior to the start of seismic shooting and during the subsequent ramp-up procedures. Otherwise, no observers will be on duty during seismic operations at night. However, LDEO bridge personnel (port and starboard seamen and one mate) will assist in marine mammal observations whenever possible, and especially during operations at night, when designated marine mammal observers will not normally be on duty. A marine mammal observer will be on ''standby'' at night, in case bridge personnel see a marine mammal. An image-intensifier night-vision device (NVD) will be available for use at night, although past experience has shown that NVDs are of limited value for this purpose.

The observer(s) will watch for marine mammals from the bridge, the highest practical vantage point on the vessel. The observer's eye level will be approximately 11 m (36 ft) above see level when stationed on the bridge, allowing for good visibility within a 210° arc. The observer(s) will systematically scan the area around the vessel with 7 X 50 Fujinon reticle binoculars or with the naked eye during the daytime. At night, night vision equipment will be available (ITT F500 Series Generation 3 binocular image intensifier or equivalent), if required. Laser rangefinding binoculars (Bushnell Lytespeed 800 laser rangefinder with 4 optics or equivalent) will be available to assist with distance estimation. If a marine mammal is seen well outside the safety radius, the vessel may be maneuvered to avoid having the mammal come within the safety radius (see Mitigation). When mammals are detected within or about to enter the designated safety radii, the airguns will be shut down immediately. The observer(s) will continue to maintain watch to determine when the animal is outside the safety radius. Airgun operations will not resume until the animal is outside the safety radius.

The vessel-based monitoring will provide data required to estimate the numbers of marine mammals exposed to various received sound levels, to document any apparent disturbance reactions, and thus to estimate the numbers of mammals potentially taken by Level B harassment. It will also provide the information needed in order to shut down the airguns at times when mammals are present in or near the safety zone. When a mammal sighting is made, the following information about the sighting will be recorded: (1) Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic vessel, sighting cue, apparent reaction to seismic vessel (e.g., none, avoidance, approach, paralleling, etc.), and behavioral pace; and (2) Time, location, heading, speed, activity of the vessel (shooting or not), sea state, visibility, cloud cover, and sun glare. The data listed under (2) will also be recorded at the start and end of each observation watch and during a watch, whenever there is a change in one or more of the variables.

All mammal observations and airgun shutdowns will be recorded in a standardized format. Data will be entered into a custom database using a laptop computer when observers are off-duty. The accuracy of the data entry will be verified by computerized validity data checks as the data are entered and by subsequent manual checking of the database. These procedures will allow initial summaries of data to be prepared during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical or other programs for further processing and archiving.

At least one experienced marine mammal observer will be on duty aboard the seismic vessel. During seismic operations in the Hess Deep area, two observers, including one qualified contract biologist and one observer appointed by LDEO, will be based aboard the vessel. Observers appointed by LDEO will complete a one-day training/refresher course on marine mammal monitoring procedures, given by a contract employee experienced in vessel-based seismic monitoring projects.

Observers will be on duty in shifts of duration no longer than 4 hours. The second observer will also be on watch part of the time, including the 30 minute periods preceding startup of the airguns and during ramp ups. Use of two simultaneous observers will increase the proportion of the marine mammals present near the source vessel that are detected. Bridge personnel additional to the dedicated marine mammal observers will also assist in detecting marine mammals and implementing mitigation requirements, and before the start of the seismic survey will be given instruction in how to do so.

Results from the vessel-based observations will provide (1) The basis for real-time mitigation (airgun shutdown); (2) Information needed to estimate the number of marine mammals potentially taken by harassment, which must be reported to NMFS; (3) Data on the occurrence, distribution, and activities of marine mammals in the area where the seismic study is conducted; (4) Information to compare the distance and distribution of marine mammals relative to the source vessel at times with and without seismic activity; and (5) Data on the behavior and movement patterns of marine mammals seen at times with and without seismic activity.

Acoustical Measurements

The acoustic measurement program is designed to verify the safety radii that will be used to determine when the air guns will be shut down to prevent marine mammals from being exposed to seismic sounds 180 (cetaceans) or 190 dB re 1µPa (rms) (pinnipeds)(see Mitigation). It will also provide the specific acoustic data needed to document the seismic sounds to which marine mammals are exposed at various distances from the seismic source, as necessary to improve the estimates of potential take by harassment and to interpret the observations of marine mammal distribution, behavior, and headings. It appears most likely that acoustical measurements will be conducted in the Gulf of Mexico during June when LDEO's vessel will be in that area for other purposes. Acoustic studies will obtain data on characteristics of the seismic survey sounds as a function of distance in deep and shallow water.

Additional details about the methods, timing and location of the acoustical verification study are provided in the LDEO application; additional information on monitoring will be provided by LDEO in an addendum to its application as plans for this effort become more specific. That addendum will address the marine mammals that might be exposed to airgun sounds during the verification study.

A report will be submitted to NMFS within 90 days after the end of the seismic program in the Hess Deep area. The end of the Hess Deep program is predicted to occur on or about July 28, 2003. The report will cover the seismic surveys in the Hess Deep area and will be submitted to NMFS, providing full documentation of methods, results, and interpretation pertaining to all monitoring tasks. The 90–day report will summarize the dates and locations of seismic operations, sound measurement data, marine mammal sightings (dates, times, locations, activities, associated seismic survey activities), and 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, NMFS has begun consultation on the proposed issuance of an IHA under section 101(a)(5)(D) of the MMPA for this activity. Consultation will be concluded prior to the issuance of an IHA.

National Environmental Policy Act (NEPA)

The NSF has prepared an EA for the Hess Deep survey. NMFS is reviewing this EA and will either adopt it or prepare its own NEPA document before making a determination on the issuance of an IHA. A copy of the NSF EA for this activity is available upon request (see **ADDRESSES**).

Preliminary Conclusions

NMFS has preliminarily determined that the short-term impact of conducting a seismic survey program in the Hess Deep portion of the Eastern Equatorial Pacific Ocean will result, at worst, in a temporary modification in behavior by certain species of marine mammals. While behavioral modifications may be made by these species as a result of seismic survey activities, this behavioral change is expected to result in no more than a negligible impact on the affected species.

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, no take by injury and/or death is anticipated, and the potential for temporary or permanent hearing impairment is low and will be avoided through the incorporation of the mitigation measures mentioned in this document.

Proposed Authorization

NMFS proposes to issue an IHA to LDEO for conducting a seismic survey program in the Hess Deep portion of the Eastern Equatorial Pacific 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 only 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 stocks for subsistence uses.

Information Solicited

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

Dated: April 7, 2003.

Laurie K. Allen,

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

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[I.D. 032502D]

Notice of Availability of Final Stock Assessment Reports

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

ACTION: Notice of completion and availability of final marine mammal stock assessment reports; response to comments.

SUMMARY: NMFS has incorporated public comments into revisions of marine mammal stock assessment reports (SARs). The 2002 final SARs are now complete and available to the public.

ADDRESSES: Send requests for printed copies of reports to: Chief, Marine Mammal Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3226, Attn: Stock Assessments.

Copies of the Alaska Regional SARs may be requested from Robyn Angliss, Alaska Fisheries Science Center (F/AKC), NMFS, 7600 Sand Point Way, NE BIN 15700, Seattle, WA 98115–0070, e-mail Robyn.Angliss@noaa.gov.

Copies of the Atlantic and Gulf of Mexico Regional SARs may be requested from Janeen Quintal, Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543, e-mail Janeen.Quintal@noaa.gov or Steven Swartz, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149, e-mail Steven.Swartz@noaa.gov.

Copies of the Pacific Regional SARs may be requested from Cathy Campbell, Southwest Regional Office (F/SWO3), NMFS, 501 West Ocean Boulevard, Long Beach, CA 90802–4213, e-mail Cathy.E.Campbell@noaa.gov.