21 June 2010

Mr. P. Michael Payne, Chief
Permits, Conservation, and Education Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Mr. Payne:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by the Lamont-Doherty Earth Observatory seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act to take small numbers of marine mammals by harassment. The taking would be incidental to a marine seismic survey in the northwest Pacific Ocean during approximately 17 days between late July and early September 2010. The Commission also has reviewed the National Marine Fisheries Service's 21 May 2010 *Federal Register* notice (75 Fed. Reg. 28568) announcing receipt of the application and proposing to issue the authorization, subject to certain conditions.

The National Science Foundation is funding the planned survey to investigate the crustal structure of the Shatsky Rise, which is located at 30–37° N latitude, 154–161° E longitude in international waters of the western North Pacific. The survey would occur in water depths greater than 1,000 m (3,280 ft) and consist of approximately 3,160 km (1,963.5 mi) of transect lines. The applicant would conduct the survey using the R/V *Marcus G. Langseth*, which would deploy a 36-airgun array (6,600 in^3) as an energy source (nominal source levels of the airgun arrays are 236 to 265 dB re 1µPa at 1 m (peak-to-peak)). The *Langseth* would tow a receiving system consisting of a 6-km-long hydrophone streamer and approximately 28 ocean bottom seismometers. In addition, the applicant would operate a 10.5–13 kHz multi-beam echo sounder during airgun operations and a sub-bottom profiler continuously throughout the cruise.

RECOMMENDATIONS

The Marine Mammal Commission recommends that, before issuing the requested authorization, the National Marine Fisheries Service—

- require the applicant to use location-specific environmental parameters to re-estimate exclusion zones and verify the estimates with field measurements prior to or at the beginning of the study;
- require the applicant to re-estimate exposures based upon location-specific environmental parameters and associated ensonified areas;
- provide additional justification for its preliminary determination that the planned monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion zones;
- clarify the qualifiers "when practical," "if practical," and "when feasible" with respect to (1) using two marine mammal observers to monitor the exclusion zone for marine mammals during daytime operations and nighttime start-ups of the airguns, (2) using crew members to

- assist observers in detecting marine mammals and implementing mitigation requirements, and (3) using marine mammal observers during daytime periods to compare sighting rates and animal behavior during times when seismic airguns are and are not operating;
- propose to the Lamont-Doherty Earth Observatory that it revise its study design to add pre- and post-seismic survey assessments as a way of obtaining more realistic baseline sighting rates for marine mammals, as well as better assessment of impacts and recovery from those impacts;
- clarify the qualifier "ideally," including the conditions under which the towed hydrophones would not be monitored, and clarify and describe the conditions that it assumes would render the use of passive acoustic monitoring impracticable for supplementing the visual monitoring program;
- extend the monitoring period to at least one hour before initiation of seismic activities and at least one hour before the resumption of airgun activities after a shutdown because of a marine mammal sighting within an exclusion zone;
- require that observations be made during all ramp-up procedures to gather the data needed to analyze and report on their effectiveness as mitigation;
- work with the applicant to correct discrepancies within the application and between the application and the Service's *Federal Register* notice; and
- advise the applicant of the need to use the 160-dB re 1 μPa (rms) threshold for all cetaceans as currently used by the Service or to explain the basis for using some other sound level as the appropriate threshold.

RATIONALE

The Service preliminarily has determined that the proposed activities would result, at most, in a temporary modification in the behavior of small numbers of up to 34 species of marine mammals and that any impact on the affected species is expected to be negligible. The Service also preliminarily has determined that no take of marine mammals by death or serious injury is anticipated and that the potential for temporary or permanent hearing impairment will be avoided through the incorporation of the proposed mitigation measures. The Service provides the following justification for its determinations:

> (1)…marine mammals are expected to move away from a noise source that is annoying before it becomes potentially injurious; (2)…cetaceans would have to be closer than 940 m (0.6 mi) in deep water when the full array is in use at a 9 m (29.5 ft) tow depth from the vessel to be exposed to levels of sound (180 dB) believed to have a minimal chance of causing permanent threshold shift; (3)…marine mammals would have to be closer than 3,850 m (2.4 mi) in deep water when the full array is in use at a 9 m (29.5 ft) tow depth from the vessel to be exposed to levels of sound (160 dB) believed to have a minimal chance at causing temporary threshold shift; and (4) [t]he likelihood that marine mammal detection ability by trained observers is high at that short distance from the vessel.

As described in the following paragraphs, the Commission's concerns regarding the proposed authorization are, for the most part, the same as those raised in its 8 June 2009 letter (enclosed) regarding the applicant's request to conduct similar activities in the northeast Pacific Ocean in 2009.

Modeling Exclusion Zones

The application uses corrected empirical measurements of propagation loss from the Gulf of Mexico in 2007–2008 (Tolstoy et al. 2009) as the basis for the estimated exposures and exclusion (safety) zones in the North Pacific. However, propagation of sound is dependent upon various location-specific environmental parameters including sound speed profiles, surface ducts, wind speed, bathymetry, water depth, and tow depth. The Marine Mammal Commission therefore recommends that the National Marine Fisheries Service require the applicant to use location-specific environmental parameters to re-estimate exclusion zones and verify the estimates with field measurements prior to or at the beginning of the study. Similarly, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the applicant to re-estimate exposures based upon location-specific environmental parameters and associated ensonified areas.

Monitoring

Visual monitoring. The Service's preliminary determination is based, in part, on the presumed efficacy of the monitoring measures. However, as discussed in the Commission's previous letters commenting on similar activities by this and other applicants, and as recognized by the Service in its previous *Federal Register* notices on similar requests, visual monitoring typically is not effective during periods of bad weather or at night and, even with good visibility, observers are unable to detect marine mammals when they are below the surface or beyond visual range. In fact, one of the Service's own scientists (Barlow 1999) found that "[a]ccounting for both submerged animals and animals that are otherwise missed by the observers in excellent survey conditions, only 23 percent of Cuvier's beaked whales and 45 percent of *Mesoplodon* beaked whales are estimated to be seen on ship surveys if they are located directly on the survey trackline." Thus, at least for certain species, visual monitoring alone is not adequate to detect all marine mammals within the exclusion zones—particularly when those zones include all areas within 940 m (0.6 mi) and 3,850 m (2.4 mi) of the vessel. Therefore, the Marine Mammal Commission recommends that, prior to granting the requested authorization, the National Marine Fisheries Service provide additional justification for its preliminary determination that the planned monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion zones. At a minimum, such justification should (1) identify those species that it believes can be detected with a high degree of confidence using visual monitoring only, (2) describe detection probability as a function of distance from the vessel, (3) describe changes in detection probability under various sea state and weather conditions and at night, and (4) explain how close to the vessel marine mammals must be for observers to achieve the anticipated high nighttime detection rate. If such information is not available, the Service and the applicant should undertake the studies needed to verify that the proposed monitoring program is likely to detect all or nearly all marine mammals in or near exclusion zones and/or to encourage development of alternative means of detecting marine mammals in or near those zones.

The *Federal Register* notice states that five observers will be based aboard the *Langseth*, and 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 airguns (noting that the use of two observers simultaneously will increase the effectiveness of detecting animals near the source vessel). It further notes that the applicant also will instruct other crew to assist in detecting marine mammals and implementing mitigation requirements if practical. The terms "when practical" and "if practical" are not clear in this instance. Similarly, the notice states that, "when feasible," marine mammal observers will make observations during daytime periods when the seismic system is not operating to compare sighting rates and animal behavior when airguns are operating versus when they are not. Here again, the term "when feasible" is not clear. The Marine Mammal Commission recommends that before issuing the requested authorization, the Service clarify the qualifiers "when practical," "if practical," and "when feasible" with respect to (1) using two marine mammal observers to monitor the exclusion zone for marine mammals during daytime operations and nighttime start-ups of the airguns, (2) using crew members to assist observers in detecting marine mammals and implementing mitigation requirements, and (3) using marine mammal observers during daytime periods to compare sighting rates and animal behavior during times when seismic airguns are and are not operating. In light of the number of similar surveys previously conducted by the applicant, it may be possible for the applicant to estimate how frequently it expects such expansion of observer effort to be implemented.

In addition, the notion that informative comparisons can be made of marine mammal observations when airguns are and are not firing depends on the periods of time that the airguns are silent. If firing of the airguns causes marine mammals to depart an area or alter their behavior, a comparison after the airguns are silenced would be meaningful only if it involved sufficient time for the marine mammals in the area to return to their normal distribution and behavior. If the time taken for the animals to return to their normal distribution and behavior exceeds the period that the airguns are silent, then any comparison would be largely meaningless as an indicator of the effects of seismic disturbance. A more meaningful approach would be to assess sighting rates in an area before the seismic study to evaluate baseline conditions and then again during and after the survey to assess immediate impacts and recovery from those impacts. With that in mind, the Marine Mammal Commission recommends that the National Marine Fisheries Service propose to the Lamont-Doherty Earth Observatory that it revise its study design to add pre- and post-seismic survey assessments as a way of obtaining more realistic baseline sighting rates for marine mammals, as well as better assessment of impacts and recovery from those impacts.

With regard to passive acoustic monitoring, the *Federal Register* notice states that the applicant will conduct vessel-based passive acoustic monitoring to augment visual monitoring during daytime operations and at night to help detect, locate, and identify marine mammals that may be present. The Commission supports the use of passive acoustic monitoring for this purpose but also considers it important to keep in mind the limitations of such monitoring. As the Commission has noted in previous correspondence, and as the Service acknowledges, passive acoustic monitoring is effective only when marine mammals vocalize, and its value is limited by water depth and other environmental factors as well as by the characteristics of the vocal repertoires of the species in the area. The effectiveness of such monitoring will depend on the ability of the acoustic system and its operators to locate vocalizing cetaceans and determine whether an acoustically detected cetacean is

within the shutdown radius or in a position such that the ship's movement will place the animal within the shutdown radius. Cetaceans that are on the trackline may be particularly hard to detect but are of relatively greater concern.

In this regard, the *Federal Register* notice states that "the towed hydrophones will *ideally* be monitored 24 hr/d while at the seismic survey area during airgun operations, and during most periods when the *Langseth* is underway while the airguns are not operating" (emphasis added). The notice further states that passive acoustic monitoring will complement the visual monitoring program "if practicable." The notice does not describe the conditions that would render the use of passive acoustic monitoring impracticable. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service clarify the qualifier "ideally," including the conditions under which the towed hydrophones would not be monitored, and clarify and describe the conditions that it assumes would render the use of passive acoustic monitoring impracticable for supplementing the visual monitoring program.

Monitoring prior to start-up and resumption of airgun activity. The Service's *Federal Register* notice states that the applicant will monitor the area for at least 30 minutes prior to the planned initiation of airgun operations. The notice also states that when airguns have been powered down or completely shut down because a marine mammal has been detected near or within a proposed exclusion zone, airgun activity will not resume until the marine mammal is outside the exclusion zone (i.e., the animal visually is observed to have left the exclusion zone or has not been seen or otherwise detected within the exclusion zone for 15 minutes in the case of small odontocetes and 30 minutes in the case of mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, and beaked whales). However, several species of cetaceans for which the applicant is seeking incidental take authority remain submerged on most dives for more than 30 minutes. Sperm whales and beaked whales, in particular, may stay submerged for periods far exceeding 30 minutes. Blainville's beaked whales dive to considerable depths (> 1,400 m [4,592 ft]) and can remain submerged for nearly an hour (Tyack et al. 2006, Baird et al. 2006). In addition, observers may not detect these animals each time they return to the surface. Accordingly, monitoring for 30 minutes prior to the planned start or resumption of airgun operations is not sufficient to allow detection of those species. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service extend the monitoring period to at least one hour before initiation of seismic activities and at least one hour before the resumption of airgun activities after a shutdown because of a marine mammal sighting within an exclusion zone.

Mitigation

Ramp-up procedures. As the Commission has noted in previous correspondence, the effectiveness of ramp-up has yet to be empirically verified. The Service should not continue to assume that ramp-up constitutes effective mitigation without empirical verification. Such verification may require not only collecting opportunistic data but also designing and conducting studies to test specific hypotheses regarding the utility of ramp-up and analysis of responses of the various species encountered. For those reasons, the Marine Mammal Commission recommends that the National Marine Fisheries Service require that observations be made during all ramp-up procedures to gather the data needed to analyze and report on their effectiveness as mitigation. Such analyses would

provide a stronger scientific basis for this particular monitoring measure. As it has noted in past correspondence, the Commission would be pleased to discuss with the Service the collection and analysis of such data and the design of such experiments to promote a better understanding of the utility and shortcomings of ramp-up as a mitigation measure.

Discrepancies To Be Addressed

Descriptions of the proposed action include discrepancies within the application and between the application and the Service's *Federal Register* notice. The Marine Mammal Commission recommends that the National Marine Fisheries Service and the applicant correct these discrepancies before the Service issues the authorization. Examples are as follows.

The last paragraph on page 8 of the application states that "[t]hirty-three cetacean species, including 26 odontocete (dolphins and small- and large-toothed whales) species and seven mysticetes (baleen whales) may occur in the Shatsky Rise study area…" but then goes on to state that "[i]nformation on the occurrence, distribution, population size, and conservation status for each of the 34 marine mammal species that may occur in the proposed study area is presented in Table 2." The text of the *Federal Register* notice refers to 34 species of marine mammals that could be taken by harassment, but Table 3 in the notice (Estimates of the Possible Numbers of Marine Mammals Exposed to Different Sound Levels during L-DEO's Proposed Seismic Survey at Shatsky Rise during July–September, 2010) lists only 32 species.

In addition, the application (page 43, paragraph 4) states that "[t]here is some uncertainty about the representativeness of the density data and the assumptions used in the calculations…" and "…there is uncertainty with respect to the expected marine mammal densities during this time." However, the application on page 45 (paragraph 3) states that "[t]he *Requested Take Authorization*, …, is based on the best estimates rather than the maximum estimates of the numbers exposed, because there was little uncertainty associated with the method of estimating densities." This latter statement is both contradictory with the statement on page 43 and incorrect, inasmuch as the Service's *Federal Register* notice clearly states that "[t]he requested take authorization, given in the far right column of Table 4 of L–DEO's application, is based on the maximum estimates rather than the best estimates of the numbers of individuals exposed, because of uncertainties associated with applying density data from one area to another."

Also, the application states that the estimated numbers of individual marine mammals potentially exposed to sound from the airgun operations are based on the 160-dB re 1 µPa (rms) threshold for all cetaceans, but then also states that a 170-dB re 1 µPa (rms) threshold will be used for delphinids, Dall's porpoises, and pinnipeds. It is not clear why the applicant is using 170-dB 1 µPa (rms) as a threshold for these latter species. In fact, the *Federal Register* notice states that "[t]he estimated numbers of individuals potentially exposed are based on the 160-dB re 1 µPa (rms) criterion for all cetaceans…. It is assumed that marine mammals exposed to airgun sounds that strong might change their behavior sufficiently to be considered 'taken by harassment.'" The Marine Mammal Commission recommends that the National Marine Fisheries Service advise the applicant of the need to use the 160-dB re 1 µPa (rms) threshold for all cetaceans as currently used by the Service or to explain the basis for using some other sound level as the appropriate threshold.

Meeting Request

As discussed in previous correspondence to the Service, seismic studies introduce a large amount of acoustic energy into the marine environment, and existing data are not sufficient for describing effects on cetacean species (with the possible exception of the sperm whale). The Commission believes that the action agency and contractor (i.e., National Science Foundation and Lamont-Doherty) bear primary responsibility for carrying out the studies needed to reduce the uncertainty and that the authorizing and oversight agencies (i.e., National Marine Fisheries Service and Marine Mammal Commission) also have a degree of responsibility. Indeed, the Commission believes that these issues can best be addressed jointly. Therefore, the Commission requests a meeting with the National Marine Fisheries Service, National Science Foundation, and Lamont-Doherty Earth Observatory to discuss (1) existing research plans and (2) needs regarding monitoring and mitigation measures. The Commission will take the initiative to arrange such a meeting.

Please contact me if you have questions about the Commission's recommendations and comments.

Sincerely,

Timothy J. Ragen, Ph.D.
Executive Director

Enclosure

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