



# MARINE MAMMAL COMMISSION

10 August 2011

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 University of Alaska Geophysics Institute 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 geophysical survey to be conducted in the Chukchi Sea and Arctic Ocean from September through October 2011. The Commission also has reviewed the National Marine Fisheries Service's 14 July 2011 *Federal Register* notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (76 Fed. Reg. 41463).

## RECOMMENDATIONS

The Marine Mammal Commission recommends that the National Marine Fisheries Service—

- require the Institute to re-estimate the proposed exclusion and buffer zones for the mitigation airgun using operational and site-specific environmental parameters and the model developed by Marine Acoustics, Inc—if the Service does not follow this recommendation, then require the Institute to provide a detailed justification for basing the exclusion and buffer zones for the proposed survey in the Chukchi Sea and Arctic Ocean on modeling that relies on measurements from the Gulf of Mexico and that is inconsistent with the modeling approach used for the 10-airgun array;
- if planning to allow the Institute to resume full power after 8 minutes under certain circumstances, specify in the authorization all conditions under which an 8-minute period could be followed by a full-power resumption of the airguns;
- prior to granting the requested authorization, provide additional justification for its preliminary determination that the proposed monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion and buffer zones, including (1) identifying those species that it believes can be detected with a high degree of confidence using visual monitoring only, (2) describing detection probability as a function of distance from the vessel, (3) describing changes in detection probability under various sea state and weather conditions and light levels, and (4) explaining how close to the vessel marine mammals must be for observers to achieve high nighttime detection rates;

- consult with the funding agency (i.e., the National Science Foundation) and individual applicants (i.e., the University of Alaska Geophysics Institute, the U.S. Geological Survey, and Lamont-Doherty Earth Observatory) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal taking and the number of marine mammals taken;
- require the applicant to (1) report the number of marine mammals that were detected acoustically and for which a power-down or shut-down of the airguns was initiated, (2) specify if such animals also were detected visually, (3) compare the results from the two monitoring methods (visual versus acoustic) to help identify their respective strengths and weaknesses, and (4) use that information to improve mitigation and monitoring methods;
- condition the authorization to require the Institute to monitor, document, and report observations during all ramp-up procedures; and
- work with the National Science Foundation to analyze those data to help determine the effectiveness of ramp-up procedures as a mitigation measure for geophysical surveys after the data are compiled and quality control measures have been completed.

## **RATIONALE**

The University of Alaska Geophysics Institute is planning a geophysical survey in the Chukchi Sea and Arctic Ocean more than 200 km offshore in the area 72.5 to 77° N latitude and 160 to 175° W longitude. The National Science Foundation is providing the funding and the Lamont-Doherty Earth Observatory would conduct the survey. The surveyed area would be within the U.S. exclusive economic zone and in international waters. The purpose is to collect seismic reflection data to define the apparent change in structure between two large continental blocks, the Chukchi Shelf and the Chukchi Borderland. The survey would include about 5,500 km of tracklines in waters 30 to 3,800 m in depth. The Lamont-Doherty Earth Observatory would use the R/V *Marcus G. Langseth* towing a 10-airgun array (nominal source level of 252 dB re 1 $\mu$ Pa at 1 m (peak-to-peak) with a maximum discharge volume of 1,830 in<sup>3</sup>). The *Langseth* also would tow one hydrophone streamer, 2 km in length, coupled with up to 72 sonobuoys. Operations also would include the use of a 10.5- to 13-kHz multibeam echo sounder during airgun operations and a 3.5-kHz sub-bottom profiler continuously throughout the survey. Finally, the operations may include the use of a 7.5-kHz acoustic Doppler current profiler to collect additional data.

The Service preliminarily has determined that, at most, the proposed activities would result in a temporary modification in the behavior of small numbers of up to 11 species of marine mammals and that any impact on the affected species would be negligible. The Service does not anticipate any take of marine mammals by death or serious injury. It also believes that the potential for temporary or permanent hearing impairment will be at the least practicable level because of the proposed mitigation and monitoring measures. Those measures include use of exclusion and buffer zones and power-down, shut-down, and ramp-up procedures.

The Institute has met with various stakeholders that use marine mammals for subsistence purposes and finalized a plan of cooperation for the proposed survey. The plan includes specific

mitigation measures in addition to those previously listed. The *Langseth* would not enter the Chukchi Sea until September to minimize impacts on the spring bowhead and beluga whale hunts. The survey would occur more than 200 km offshore, which would preclude impacts on the fall bowhead hunt and ice seal hunt. A knowledgeable Barrow resident would serve as a protected species observer during the survey and would act as a liaison with hunters and fishers if they are encountered at sea. In addition, airgun operations would be suspended if subsistence fishing or hunting is occurring within 5 km of the vessel. Based on the timing and location of the proposed activities and these additional mitigation measures, the Service preliminarily has determined that the expected taking would not have an unmitigable adverse impact on the availability of marine mammals for subsistence use by Alaska Natives.

### **Uncertainty in Modeling Exclusion and Buffer Zones**

Exclusion zones are intended to protect marine mammals that are close enough to a sound source to be injured (i.e., Level A harassment) or killed by exposure to the sound. Buffer zones are used to delineate the area in which Level B harassment may occur and to estimate the number of marine mammals that may be taken. Both zones are established based on the generation and propagation of sound from the source and general assumptions about the responses of marine mammals to sounds at specific sound pressure levels, the latter being based on limited observations of marine mammal responses under known conditions.

In 2007–2008, the Lamont-Doherty Earth Observatory conducted sound propagation studies using airgun arrays from the *Langseth* (Tolstoy et al. 2009) and used results from those studies to create a model of sound propagation for estimating exclusion and buffer zones. However, that model was based on a particular set of environmental conditions, and variation in such conditions is known to affect the manner in which sound propagates through the ocean. Indeed, Tolstoy et al. (2009) not only noted that results vary with environmental conditions but also used that variation as justification for measuring sound propagation at multiple locations. The National Science Foundation followed that example in its programmatic environmental impact statement for geophysical surveys by modeling sound propagation under various environmental conditions. Furthermore, Tolstoy et al. (2009) acknowledged that sound propagation is not only variable, but also dependent on water depth and bathymetry. Specifically, the Observatory's model overestimates actual received sound levels in deep water (> 1,000 m) and underestimates actual received sound levels in shallow water (< 50 m). Such deviations raise questions regarding the efficacy of the model for estimating received sound levels at certain distances and for establishing exclusion and buffer zones.

In preparation for the proposed survey, the University of Alaska Geophysics Institute used the Observatory's model to estimate exclusion and buffer zones for the mitigation airgun. As applied, the Commission must question the application of this model in this case because it is—

- (1) based on a 36-airgun array sound source, which will not be used in this survey;

(2) based on shallow and deep water from the Gulf of Mexico, which are not consistent with shallow, intermediate, and deep water depths in the Chukchi Sea; and

(3) not based on site-specific operational and environmental parameters, which are known to be available because the Institute used them with the Marine Acoustics, Inc., model for the 10-airgun array.

The question, then, is whether these deviations from expected practice have more than a negligible effect on the estimation of exclusion and buffer zones—that is, do they introduce an unacceptable level of bias in the estimation of those zones. It is not possible to make that determination unless the Institute makes and reports the necessary comparisons so that reviewers can make an informed judgment as to whether the bias is substantial and adds significant risks to the marine mammals that may be encountered during the survey.

To address these shortcomings, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the Institute to re-estimate the proposed exclusion and buffer zones for the mitigation airgun using operational and site-specific environmental parameters and the model developed by Marine Acoustics, Inc. If the Service does not follow this recommendation, then the Marine Mammal Commission recommends that the Service require the Institute to provide a detailed justification for basing the exclusion and buffer zones for the proposed survey in the Chukchi Sea and Arctic Ocean on modeling that relies on measurements from the Gulf of Mexico and that is inconsistent with the modeling approach used for the 10-airgun array.

### **Mitigation and Monitoring Measures**

The *Federal Register* notice states that the Institute will monitor the area near the seismic vessel for at least 30 minutes prior to the initiation of airgun operations. The notice also states that when airguns have been powered down or 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 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). However, the *Federal Register* notice also indicates that ramp-up procedures could begin only 8 minutes after a marine mammal sighting based on the theory that the movement of the *Langseth* would result in sufficient separation during that timeframe. Because the timeframes were not consistent, the Commission questioned why multiple timeframes were to be used when ramping up the airgun array. The National Science Foundation has since clarified that the 8-minute timeframe is not actually associated with ramping up the airgun array, rather the Institute would restart the airguns at full power after 8 minutes under certain circumstances. Those specific circumstances include an equipment failure that is fixed quickly when no marine mammals have been observed within the exclusion zone before or during the failure, or when a marine mammal is seen within the exclusion zone but is observed leaving the exclusion zone. Resumption of the full array after the abbreviated timeframe may be reasonable in those specific circumstances but may pose an unacceptable level of

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risk in others. If the Service is planning to allow the Institute to resume full power after 8 minutes under certain circumstances, then the Marine Mammal Commission recommends that the National Marine Fisheries Service specify in the authorization all conditions under which an 8-minute period could be followed by a full-power resumption of the airguns.

As discussed in the Commission's previous letters commenting on similar activities by this and other applicants, visual monitoring is not effective during periods of bad weather or at night. 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 proposed monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion and buffer 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 light levels, and (4) explain how close to the vessel marine mammals must be for observers to achieve high nighttime detection rates. If such information is not available, the Service and the applicant should conduct the studies needed to describe the efficacy of existing monitoring methods and develop alternative or supplemental methods to address current shortcomings.

In addition, the applicant indicates that it will be able to assess possible impacts by comparing estimated marine mammal abundance during periods when the airguns are not firing (which the applicant refers to as baseline conditions) with periods when they are. The efficacy of this approach depends, in part, on the length of the periods when the airguns are silent. If firing of the airguns causes marine mammals to depart an area and/or alter their behavior, a comparison after the airguns are silenced would be meaningful only if it involved sufficient time for the disturbed marine mammals to return to their normal distribution and/or behavior. If the time for such a return to normalcy exceeds the period that the airguns are silent, then any comparison would be largely meaningless as an indicator of the impact of seismic disturbance. Put frankly, the Commission does not believe that the proposed monitoring method is scientifically sound. The Marine Mammal Protection Act requires that the National Marine Fisheries Service (for the Secretary of Commerce) put forth "requirements pertaining to the monitoring and reporting of such taking." Although the Act is not explicit on this point, the Commission believes that Congress's intent was that those monitoring and reporting methods be scientifically sound and yield sufficient information to confirm that the authorized taking is having only negligible impacts on the affected species and stocks. That is, the monitoring and reporting requirements should provide a reasonably accurate assessment of the types of taking and the number of animals taken by the proposed activity. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service consult with the funding agency (i.e., the National Science Foundation) and individual applicants (i.e., the University of Alaska Geophysics Institute, the U.S. Geological Survey, and Lamont-Doherty Earth Observatory) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal taking and the number of marine mammals taken. Without such a system in place, the Commission

does not see how the Service can continue to assume that this type of survey has no more than a negligible impact on marine mammal populations.

The *Federal Register* notice states that the applicant also 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. In addition, the effectiveness of passive acoustic monitoring will depend on the operator's ability to locate a vocalizing cetacean and determine whether it is within the power-down or shut-down radii or in a position such that the ship's movement will place it within the power-down or shut-down radii. Cetaceans that are directly on the trackline can be particularly hard to detect and, because of their position and proximity to the sound source, are at elevated risk from sound exposure. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the applicant to (1) report the number of marine mammals that were detected acoustically and for which a power-down or shut-down of the airguns was initiated, (2) specify if such animals also were detected visually, (3) compare the results from the two monitoring methods (visual versus acoustic) to help identify their respective strengths and weaknesses, and (4) use that information to improve mitigation and monitoring methods.

### **Effectiveness of Ramp-up Procedures**

As the Commission has noted in previous correspondence, the effectiveness of ramp-up procedures has yet to be verified empirically. In October 2010 representatives from the Service, Commission, National Science Foundation, U.S. Geological Survey, Lamont-Doherty Earth Observatory, and Scripps Institution of Oceanography met to discuss mitigation and monitoring measures. Among other things, the participants discussed the need to verify the utility of ramp-up procedures. The Commission continues to believe that such verification is important and should be pursued whenever possible. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service condition the authorization to require the Institute to monitor, document, and report observations during all ramp-up procedures. Such data will provide a stronger scientific basis for determining the effectiveness of, and deciding when to implement, this particular mitigation measure. The National Science Foundation has indicated that monitoring data from past surveys are being compiled into a single database. The Commission supports that effort by the Foundation. After the data are compiled and quality control measures have been completed, the Marine Mammal Commission recommends that the National Marine Fisheries Service work with the National Science Foundation to analyze those data to help determine the effectiveness of ramp-up procedures as a mitigation measure for geophysical surveys. International researchers also are trying to determine the impacts of seismic airguns and the effectiveness of ramp-up procedures, primarily on humpback whales, during specific life history stages. However, the results of those studies are not expected for three to five years. In the interim, the Commission continues to believe that the Service should be requiring data collection and analysis to assess the effectiveness of ramp-up procedures, given that those procedures are considered a substantial component of the mitigation measures.

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### **Level A Harassment and Mortality**

The Institute is not seeking authorization to take marine mammals by serious injury or mortality. However, it has included a phased approach for suspending activities and reporting injuries and deaths. The *Federal Register* notice indicates that the Institute would immediately cease activities if its activities clearly caused an injury or death. The Service then would notify the Institute when it could resume its activities. The notice also indicates that injuries and deaths clearly caused by the Institute and injuries and deaths that the lead protected species observer deems recent (i.e., fresh carcasses), but from an unknown cause, would be reported immediately to the Service and local stranding network. If an injured or dead marine mammal was discovered and the lead protected species observer deems that the injury or death was not associated with the Institute's activities (i.e., previously wounded animal, carcass with moderate or advanced decomposition, or scavenged carcasses), then it would report the injury or death to the Service and local stranding network within 24 hours. The Institute would provide photographs, video footage (if available), and other relevant data to the Service and local stranding network. The Commission believes that the phased approach is a much needed improvement to the standard monitoring and reporting measures for injuries and deaths and commends the Service and Institute for including such an approach.

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

Sincerely,



Timothy J. Ragen, Ph.D.  
Executive Director

### References

Tolstoy, M., J. Diebold, L. Doermann, S. Nooner, S.C. Webb, D.R. Bohnstiehl, T.J. Crone, and R.C. Holmes. 2009. Broadband calibration of R/V *Marcus G. Langseth* four-string seismic sources. *Geochemistry, Geophysics, Geosystems* 10, Q08011, doi:10.1029/2009GC002451.