18 August 2014

Ms. Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by the National Science Foundation (NSF) Division of Polar Programs and Antarctic Support Contract (ASC)[1] seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act (the MMPA) to take small numbers of marine mammals by harassment. The taking would be incidental to a marine geophysical survey to be conducted in the Scotia Sea and South Atlantic Ocean in September and October 2014. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 5 August 2014 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (79 Fed. Reg. 45592).

Some issues raised in previous letters regarding geophysical surveys reflect Commission concerns that apply more broadly to incidental take authorization applications beyond NSF and ASC's proposed application. The Commission has recommended repeatedly that NMFS adjust density estimates using some measure of uncertainty when available density data originate from different geographical areas and temporal scales and that it formulate policy or guidance shaping a consistent approach for how applicants should incorporate uncertainty in density estimates. NMFS has indicated that it is currently evaluating available density information and working on guidance that would outline a consistent approach for addressing uncertainty in specific situations where certain types of data are or are not available (78 Fed. Reg. 57354). In addition, NMFS has yet to develop a clear policy setting forth more explicit criteria and/or thresholds for making small numbers and negligible impact determinations, as recommended by the Commission. The Commission understands that NMFS is in the process of developing both a clearer policy to outline the criteria for determining what constitutes "small numbers" and an improved analytical framework for determining whether an activity will have a "negligible impact" for the purpose of authorizing takes of marine mammals and that NMFS plans to engage the Commission in that process at the appropriate time (79 Fed. Reg. 13626). The Commission welcomes the opportunity to meet with NMFS to review these higher-level recommendations, as well as those specific to NSF and ASC's application.

[1] NSF and ASC submitted the application on behalf of the University of Texas at Austin and University of Memphis. NSF is funding the research and ASC would operate the source vessel.

Background

NSF and ASC propose to conduct a low-energy geophysical survey in the exclusive economic zone of the South Georgia and South Sandwich Islands and international waters in the Scotia Sea and South Atlantic Ocean. The purpose of the proposed survey is to evaluate the lithosphere adjacent to and beneath the Scotia Sea and South Atlantic Ocean. The survey would be conducted in waters estimated to be 1,000 to 4,000 m in depth with approximately 2,950 km of tracklines. It would use the R/V *Nathaniel B. Palmer* to tow a two-airgun array (nominal source level of 234 dB re 1μPa at 1 m (peak) with a maximum discharge volume of 210 in^3) at 3 to 4 m depth. The *Palmer* also would tow one hydrophone streamer, 100 m in length, during the survey. ASC would operate a single-beam echosounder (at 3 kHz for bottom-tracking and 12 kHz for sub-bottom profiling purposes), a multibeam echosounder (at 12 kHz), an acoustic Doppler current profiler (ACDP; at 150 kHz), a gravity meter, magnetometer, and deploy up to 60 expendable bathythermographs throughout the survey. In addition, ASC would collect dredge samples using various sampling devices.

NMFS preliminarily has determined that, at most, the proposed activities would result in a temporary modification in the behavior of small numbers of up to 26 species of marine mammals and that any impact on the affected species would be negligible. NMFS 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 (1) monitoring exclusion and buffer zones, (2) using shut-down and ramp-up procedures, and (3) speed and course alterations, if safe and practicable.

Staff members from NMFS, NSF, Lamont-Doherty Earth Observatory (LDEO), U.S. Geological Survey (USGS), and the Commission met in March 2013 to discuss some of the Commission's ongoing concerns regarding the potential effects of geophysical surveys. Although a number of concerns were discussed and several resolved, the following sections highlight areas that, in the Commission's view, warrant further attention.

Uncertainty in modeling exclusion and buffer zones

The Commission continues to have concerns regarding the method used to estimate exclusion and buffer zones (based on Level A and B harassment, respectively) and the numbers of takes for NSF-funded geophysical research. These concerns date back to 2010 (please refer to the Commission's 12 March, 19 April, and 24 June 2013 and 31 March and 23 July 2014 letters for detailed rationale). Briefly, LDEO performs acoustic modeling for geophysical research funded by NSF. For at least 6 years (and likely more than the last 10 years), LDEO has estimated exclusion and buffer zones using a simple ray trace–based modeling approach that assumes spherical spreading, a constant sound speed, and no bottom interactions (Diebold et al. 2010). That model does not incorporate environmental characteristics of the specific study area including sound speed profiles and refraction within the water column, bathymetry/water depth, sediment properties/bottom loss, or absorption coefficients. However, LDEO continues to believe that its model generally is conservative when compared to in-situ sound propagation measurements of the R/V *Maurice Ewing*'s arrays (i.e., 6-, 10-, 12-, and 20-airgun arrays) and the R/V *Marcus G. Langseth*'s 36-airgun

array from the Gulf of Mexico (Tolstoy et al. 2004, Tolstoy et al. 2009, Diebold et al. 2010[2]). LDEO also has noted the model is most directly applicable to deep water (> 1,000 m). Diebold et al. (2010) noted the limited applicability of LDEO's model when sound propagation is dependent on water temperature, water depth, bathymetry, and bottom-loss parameters. They further indicated that modeling could be improved by including realistic sound speed profiles within the water column. In addition, Tolstoy et al. (2009) acknowledged that sound propagation depends on water depth, bathymetry, and tow depth of the array and that sound propagation varies with environmental conditions and should be measured at multiple locations.

To estimate the proposed exclusion and buffer zones for the survey in the Scotia Sea and South Atlantic Ocean, LDEO used two G airguns as a proxy for two GI airguns within the Nucleus modeling software and assumed a maximum tow depth of 3 m. The Commission is unsure why LDEO did not use 4 m as the maximum tow depth, because that depth was specified in the application and should yield greater radii[3] than a tow depth of 3 m. It also is unclear why LDEO included in Appendix A of NSF's Initial Environmental Evaluation/Environmental Assessment the correction factors based on shallow-water measurements of 2-GI airguns in the Gulf of Mexico. The need for correction factors as large as 14.7 does substantiate the concerns continually expressed by the Commission regarding the inadequacies of the LDEO model in environments other than a three dimensionally uniform and boundless sea. However, the discussion of such correction factors is irrelevant because the radii LDEO proposed to use originated directly from its model, absent any correction factors. The Commission does not understand why LDEO mentioned correction factors that apparently were not used.

LDEO indicated in other recent authorization applications that the calibration data show that at greater distances (4 to 5 km) sound reflected from the sea floor and refracted from the sub-seafloor dominate, while the direct arrivals become weak and/or incoherent (Figures 11, 12, and 16 in Appendix H of the NSF/USGS programmatic environmental impact statement for geophysical surveys (PEIS)). LDEO stated that aside from local topography effects, the region around the critical distance (~5 km in Figures 11 and 12 and ~4 km in Figure 16 in Appendix H of the NSF/USGS PEIS) is where the observed sound levels rise very close to the mitigation model curve. Although the observed sound levels occur primarily below the mitigation model curve, that finding further substantiates the fact that the model is not necessarily indicative of site-specific environmental conditions, including bathymetry and sound speed profiles. The reflective/refractive arrivals are the very measurements that should be accounted for in site-specific modeling and ultimately determine underwater sound propagation.

Because LDEO has failed to verify the use of its model in conditions other than the Gulf of Mexico, the Commission has recommended that NMFS or the relevant entity estimate exclusion and buffer zones using either empirical measurements from the particular survey site or a model that accounts for the conditions in the proposed survey area. The model should incorporate operational parameters (e.g., tow depth, source level, number/spacing of active airguns) and site-specific environmental parameters (e.g., sound speed profiles, refraction in the water column, bathymetry/water depth, sediment properties/bottom loss, and wind speed). In March 2013, LDEO

[2] Diebold et al. (2010) also presented data on the 18-airgun array from the Gulf of Mexico.
[3] Based on scaling factors previously used by LDEO that do not appear to have been used for this proposed authorization.

indicated that it might be able to compare its model to hydrophone data collected during previous surveys in environmental conditions other than those in the Gulf of Mexico (i.e., deep and intermediate waters in cold water environments that may have surface ducting conditions, shallow-water environments, etc.). The Commission understands that LDEO has been analyzing hydrophone data from waters off Washington State to allow comparisons of empirically derived estimates to model-estimated exclusion and buffer zones, but those results do not appear to have been published yet. The Commission is pleased to hear of this work and encourages LDEO to make such comparisons at various sites, not just in waters off Washington, if it intends to continue using a model that does not incorporate site-specific parameters. The Commission recommended in its 24 June 2013 letter that such comparisons be made prior to submitting applications for geophysical surveys to be conducted in 2014. The Commission further recommended that if LDEO and NSF either do not have enough data to compare LDEO's modeled results to other environments, or choose not to assess the accuracy of the model, then they should re-estimate the exclusion and buffer zones and associated takes of marine mammals using site-specific parameters (including sound speed profiles, bathymetry, and bottom characteristics) for all future applications that use LDEO's model. Neither approach was used for the proposed incidental harassment authorization.

NMFS has indicated repeatedly that NSF, LDEO, and other relevant entities (USGS, Scripps Institution of Oceanography (Scripps)) are providing sufficient scientific justification for their take estimates. The Commission disagrees with this conclusion, given that the estimates are based on LDEO's simplistic model and various correction factors that are not grounded in rigorous science. Furthermore, recent activities have occurred in areas such as the Antarctic and South Atlantic Ocean rather than the warm- or temperate water regions where LDEO normally operates. Environmental conditions in the Antarctic survey area not only include sound speed profiles that represent cold-water conditions (increased sound speeds), surface ducts, and in-water refraction but also bathymetry and sediment characteristics that reflect sound. None of these parameters are accounted for in LDEO's model.

In a recent sound exposure modeling workshop attended by numerous entities (including NMFS, LDEO, NSF, USGS, and the Commission), experts confirmed that sound speed profiles and bathymetry/sediment characteristics were the most important factors affecting underwater sound propagation and should be included in related modeling. While LDEO presented various aspects of its model during the workshop and indicated that the model was fast, inexpensive, and simple to use, none of those attributes support its applicability or accuracy. Further, LDEO indicated that the model is more closely related to a source model that compares airgun arrays and that it is not representative of modeling in the actual environment. Therefore, the Commission remains very concerned that the LDEO model is not based on best available science and does not support its continued use. For all of these reasons, the Commission recommends that NMFS (1) require LDEO to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific (including sound speed profiles, bathymetry, and sediment characteristics at a minimum) and operational (including number/type of airguns, tow depth) parameters for the proposed incidental harassment authorization and (2) impose the same requirement for all future incidental harassment authorizations submitted by NSF, ASC, LDEO, USGS, Scripps, or any other relevant entity.

In 2011[4], NSF and USGS modeled sound propagation under various environmental conditions in their PEIS. LDEO and NSF (in cooperation with Pacific Gas and Electric Company) also used a similar modeling approach in the recent incidental harassment authorization application and associated environmental assessment for a geophysical survey of Diablo Canyon in California (77 Fed. Reg. 58256). These recent examples indicate that LDEO, NSF, and related entities are able to implement the recommended modeling approach, if required to do so by NMFS. The Commission understands the constraints imposed by the current budgetary environment, but notes that other agencies that contend with similar funding constraints incorporate modeling based on site-specific parameters. LDEO, NSF, and related entities (ASC, USGS, Scripps) should be held to that same standard. NMFS recently indicated that it does not prescribe the use of any particular modeling package and does not believe it is appropriate to do so (79 Fed. Reg. 38499). The Commission agrees that NMFS should not instruct applicants to use specific contractors or modeling packages, but it should hold applicants to the same standard, primarily one in which site- and operation-specific environmental parameters are incorporated into the models.

Takes associated with echosounders and sub-bottom profilers

The Commission has recommended that NMFS follow a consistent approach in assessing the potential for takes by Level B harassment from exposure to specific types of sound sources (e.g., echosounders, sub-bottom profilers, side-scan sonar, and fish-finding sonar) by all applicants who propose to use them[5]. NMFS has indicated that it is evaluating the broader use of those types of sources to determine under what specific circumstances requests for incidental taking would be advisable (or not) and also is working on guidance that would outline a consistent approach for addressing potential impacts from those types of sources (78 Fed. Reg. 57354). For this proposed incidental harassment authorization, NMFS indicated in the *Federal Register* notice that take was not authorized specifically for echosounders, sub-bottom profilers, or ADCPs beyond that which is proposed to be authorized for the airgun survey (see 79 Fed. Reg. 45617). However, NMFS then proposed to include those sources in the incidental harassment authorization as sources of taking by Level B harassment (see item 4 on page 45623). The Commission is unsure why NMFS does not believe that the use of echosounders, sub-bottom profilers, and ADCPs have the potential to result in Level B harassment when the airguns are not firing. And, at the same time, the Commission does not understand why they are included in the proposed authorization if NMFS does not believe that takes for those sources need to be accounted for. Due to this inconsistency, the Commission recommends that NMFS either estimate the numbers of takes that could occur during the bathymetric survey, which includes the use of the multi-beam echosounder and sub-bottom profiler absent the airguns, or not include authorization for taking by the acoustic sources (echosounder, sub-bottom profiler, ADCP) in the final incidental harassment authorization.

Monitoring measures

In previous letters, the Commission has indicated that monitoring and reporting requirements should be sufficient to provide a reasonably accurate assessment of the manner of taking and the numbers of animals taken by the proposed activity, specifically to verify that only small numbers of marine mammals are being taken and that the impacts are negligible. The

[4] The record of decision was signed in 2012.
[5] Please refer to the Commission's 30 January 2014 letter detailing its rationale.

Commission continues to believe those assessments need to account for animals at the surface but not detected and for animals present but underwater and not available for sighting, which are accounted for by g(0) and f(0) values. NMFS's most recent response to the Commission's comments indicated that the MMPA implementing regulations require that applicants include monitoring that will result in "an increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities . . ." This increased knowledge of the level of taking could be qualitative or relative in nature, or it could be more directly quantitative (79 Fed. Reg. 38503). The Commission believes that NMFS misinterpreted its implementing regulations in its response. Those regulations state that applicants are to specify—

> The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities, and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity.

Although this portion of the regulations[6] is not particularly clear, it appears that the phrase "increased knowledge" is intended to modify the clause "of the species" and not "the level of taking or impacts on the populations of marine mammals that are expected to be present while conducting activities". If the phrase "increased knowledge of" is intended to apply throughout the remainder of the provision, as NMFS suggests, then the portion requiring the applicant to provide "suggested means of minimizing burdens…" makes no sense. A better interpretation of the provision is that the applicant is to suggest monitoring and reporting measures that will (1) increase the knowledge regarding the species and (2) provide the necessary information regarding the level of incidental taking that occurs and the impacts of such taking on the affected marine mammal populations. Such an interpretation is consistent with the statutory structure, which under section 101(a)(5)(D)(iv) requires that NMFS "modify, suspend, or revoke an authorization" if it finds, among other things, that the authorized taking is having more than a negligible impact or that more than small numbers of marine mammals are being taken. It is through the prescribed monitoring and reporting requirements that NMFS collects the information necessary to make those determinations. As such, those requirements need to be sufficient to provide accurate information on the numbers of marine mammals being taken and the manner in which they are taken, not merely better information on the qualitative nature of the impacts. Accordingly, the Commission continues to believe that appropriate g(0) and f(0) values are essential for making accurate estimates of the numbers of marine mammals taken during surveys. To be applicable for the proposed survey, the corrections should be based on the ability of the protected species observers to detect marine mammals rather than a hypothetical optimum derived from scientific studies (e.g., from NMFS's shipboard surveys).

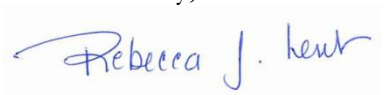
Therefore, the Commission again recommends that NMFS consult with NSF, ASC, and other relevant entities (e.g., LDEO, USGS, Scripps) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types

[6] The Commission also questions whether the cited regulation is even the relevant one upon which NMFS should be relying. It merely specifies what applicants should be suggesting when applying for an incidental take authorization. NMFS has an independent responsibility under the MMPA to specify monitoring and reporting requirements that are sufficient for it determine that the statutory requirements are being met.

of marine mammal takes and the actual numbers of marine mammals taken by incorporating applicable g(0) and f(0) values. NMFS recently stated that although it does not generally believe that post-activity take estimates using f(0) and g(0) are *required* to meet the monitoring requirement of the MMPA, in the context of the NSF and LDEO's monitoring plan, NMFS agreed that developing and incorporating a way to better interpret the results of their monitoring (perhaps a simplified or generalized version of g(0) and f(0)) is a good idea. NMFS further stated it would consult with the Commission and NMFS scientists prior to finalizing the recommendations (79 Fed. Reg. 38503). The Commission welcomes such a meeting.

The Commission looks forward to collaborating with NMFS on the various guidance documents and issues raised in this letter. Please contact me if you have questions concerning the Commission's recommendations.

Sincerely,



Rebecca J. Lent, Ph.D.
Executive Director

Cc: Holly Smith, National Science Foundation
Helene Carton, Lamont-Doherty Earth Observatory

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