30 January 2014

Mr. P. Michael Payne, Chief
Permits and Conservation 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 (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 Dumont d'Urville Sea off the coast of East Antarctica from January through March 2014. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 3 January 2014 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (79 Fed. Reg. 464).

Some issues raised in this letter reflect Commission concerns that are applicable to incidental take authorization applications beyond NSF and ASC's proposed application. The higher-level concerns discussed herein include recommendations that NMFS adopt policies and provide standard guidance applicable to all incidental harassment applications (or at least a subset of those involving geophysical surveys) to ensure a consistent approach for all relevant applications. The Commission welcomes an opportunity to meet with NMFS to review these higher-level recommendations, as well as those specific to NSF and ASC's application.

RECOMMENDATIONS

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

- require NSF and ASC to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific parameters (including at least sound speed profiles, bathymetry, and sediment characteristics) for the proposed incidental harassment authorization—NMFS should make the same requirement for all future incidental harassment authorizations submitted by NSF, ASC, LDEO, USGS, Scripps, or any other related entity;

[1] NSF and ASC submitted the application on behalf of Colgate University, Columbia University, Texas A&M Research Foundation, University of South Florida, and University of Texas at Austin. NSF is funding the research and ASC would operate the source vessel.

- (1) require NSF and ASC to revise its take estimates to include Level B harassment takes associated with the use of the single-beam and multibeam echosounder when the airgun array is not firing and (2) follow a consistent approach of requiring the assessment of Level B harassment takes for those types of sound sources (e.g., sub-bottom profilers, echosounders, side-scan sonar, and fish-finding sonar) by all applicants, who propose to use such sources;
- require NSF and ASC to estimate the numbers of marine mammals taken when the single-beam and multibeam echosounder are used in the absence of the airgun array based on the 120- rather than the 160-dB re 1 μPa threshold;
- consult with experts in the field of acoustics and marine mammal hearing to revise the Level B harassment thresholds for behavior to specify threshold levels that would be more appropriate for a wider range of sound sources, including shallow penetration sub-bottom profilers, echosounders, and side-scan sonar—if NMFS plans to propose behavior thresholds for seismic surveys separate from other activities, include thresholds for all types of sources that are used, not just for airguns;
- consult with the funding agency (i.e., NSF) and individual applicants (e.g., Lamont-Doherty Earth Observatory (LDEO), Scripps Institution of Oceanography (Scripps), and U.S. Geological Survey (USGS)) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken—the assessment should account for applicable g(0) and f(0) values; and
- (1) provide a full 30-day public review and comment period that starts with the publication of notices in the printed edition of the *Federal Register* and (2) allow sufficient time after the close of the comment period and prior to issuance of an incidental harassment authorization to allow the agency to analyze, consider, respond to, and make any necessary changes to the proposed authorization or the Service's rationale based on those comments.

RATIONALE

NSF and ASC propose to conduct a low-energy geophysical survey in international waters in the Southern Ocean from 64 to 65º S and 95 to 165º E. The purpose of the proposed survey is to understand the dynamics and controls of the Totten Glacier System and to resolve ambiguity in large ice mass dynamic behavior. The survey would be conducted in waters estimated to be 100 to 1,000 m in depth with approximately 2,800 km of tracklines. It would use the R/V *Nathaniel B. Palmer* to tow a two-airgun array (nominal source level of 224.6 dB re 1μPa at 1 m (peak) with a maximum discharge volume of 210 in^3) at 3 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) and a multibeam echosounder (at 12 kHz) continuously throughout the survey.

In addition, ASC would collect both core and dredge samples using various sampling devices and water samples using conductivity, temperature, depth systems (CTDs). A 12-kHz acoustic locator would be used to locate the grab sampler and multi-corer if they become detached from their lines, and a 150-kHz Acoustic Doppler Current Profiler (ADCP) would be used to collect water samples with the CTD. ASC would deploy two short- and two-long term moorings (for one month and one year, respectively) that include ADCPs, CTDs, and other temperature recorders. Finally, NSF and ASC expect that ice-breaking activities would occur in waters north of the survey area

while the *Palmer* is transiting. The geophysical survey would not occur concurrently with ice-breaking activities.

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 14 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 monitoring exclusion and buffer zones and using shut-down and ramp-up procedures.

After discussions with the Commission, NMFS did indicate that a few issues would be amended prior to issuance of the incidental harassment authorization. Those included:

- using practical rather than spherical spreading loss to determine the range to the Level B harassment zone for ice-breaking activities (21.54 vs. 1.75 km, respectively) and associated numbers of marine mammals that could be taken;
- using crabeater seal density based on Southwell et al. 2008 rather than raw sightings data from undedicated pinniped surveys and based on various assumptions;
- using of 800 m rather than 5 km for the strip width to determine the density of Ross and leopard seals; and
- adjusting the densities of hauled out crabeater, Ross, leopard, and Weddell seals by the number of seals expected to be in the water to estimate the numbers of takes for the airgun survey.

The Commission has recommended numerous times that NMFS adjust density estimates using some measure of uncertainty when available density data differ based on geographical and temporal scales. Further, the Commission has recommended that NMFS formulate policy or guidance regarding a consistent approach for how applicants should incorporate uncertainty in density estimates. Accordingly, NMFS has indicated that it is currently evaluating available density information and is 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). The Commission is unsure of the status of that guidance but would welcome a meeting with NMFS to discuss the guidance before it is finalized.

Staff members from the NSF, NMFS, USGS, LDEO, and the Commission met in winter 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 paragraphs 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 model that is used to estimate sound propagation 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 letters for detailed rationale). Briefly, LDEO conducts acoustic modeling for NSF-funded geophysical research. For at least 6 years (and likely more than the last 10 years), LDEO has estimated exclusion and buffer zones (based on Level A and B harassment, respectively) 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 believes 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) and is most directly applicable to deep water (> 1,000 m). Diebold et al. (2010) did note the limited applicability of LDEO's model when sound propagation is dependent on water temperature, water depth, bathymetry, and bottom-loss parameters, all of which are factors of concern for a survey in water depths as shallow as 100 m. 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. Therefore, the Commission has concerns regarding the continued use of LDEO's model.

Those concerns are based primarily on the need to test and verify the use of LDEO's model under the specific environmental conditions that would be encountered with each survey. For that reason, 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 takes into account 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 winter 2013 LDEO indicated that it possibly could compare its model to hydrophone data collected during previous surveys that would represent 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.). It is unclear if LDEO or NSF has done this. But the Commission did recommend in its 24 June 2013 letter that those comparisons be made prior to the submittal of 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 model to other environments or do not 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.

LDEO indicated at the winter 2013 meeting that the sound speed parameter could be changed within its model. But when LDEO conducted a sensitivity analysis and changed the sound speed by 70 m/s, the exclusion zones only changed by 2 percent (78 Fed. Reg. 57354). It is important to note, however, that such a small change in the resulting zones based on a 70 m/s change in sound speeds is attained only under the conditions of an unrealistic model to which it is applied. A change in the resulting zones likely would be significantly greater if determined either empirically or by using a model that incorporates site-specific parameters. The small change reinforces the fact that the LDEO model effectively is a spherical spreading model that does not account for site-specific parameters and should not be used for determining ranges to various zones for mitigation or take estimation purposes.

NMFS has indicated that NSF, LDEO, and other relevant entities (USGS, 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 model or empirical measurements in the Gulf of Mexico and these activities are occurring in areas such as the Antarctic. 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 that was attended by numerous entities (NMFS, NSF, LDEO, USGS, and the Commission), experts confirmed that both 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 simplistic, none of those attributes support its applicability or accuracy. Further, LDEO indicated that the model was more closely related to a source model that compares airgun arrays and was not representative of modeling in the environment. Therefore, the Commission cannot support continued use of the LDEO model and remains concerned that it is not based on best available science. For all of these reasons, the Commission recommends that NMFS require NSF and ASC to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific parameters (including at least sound speed profiles, bathymetry, and sediment characteristics) for the proposed incidental harassment authorization—NMFS should make the same requirement for all future incidental harassment authorizations submitted by NSF, ASC, LDEO, USGS, Scripps, or any other related entity.

A few years ago, NSF and USGS modeled sound propagation under various environmental conditions in their programmatic environmental impact statement for geophysical surveys worldwide. 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 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. NSF and related entities (LDEO, USGS, Scripps) should be held to that same standard.

Takes associated with the single-beam and multibeam echosounders

NSF and ASC estimated the numbers of Level B harassment takes associated with the two-airgun array. However, they did not estimate the numbers of takes associated with the use of the single beam or multibeam echosounder, which would be used continuously during the survey, including when the airgun array would not be firing. NMFS did not require NSF and ASC to estimate the numbers of takes associated with the use of those sources in the absence of the array firing. The Commission disagrees with that decision.

On several occasions, NMFS has determined that sound from echosounders are within the hearing range of marine mammals and have the potential to cause Level B harassment. For example,

NMFS recently issued an incidental harassment authorization to Cape Wind Associates for the use of a single-beam depth sounder, multibeam depth sounder, side-scan sonar, magnetometer, shallow-penetration sub-bottom profiler, and medium-penetration sub-bottom profiler to conduct site assessment surveys for renewable energy development off Nantucket Island (78 Fed. Reg. 19217). Those sources generally are the same as those being proposed by NSF and ASC for use during their geophysical survey. In addition, NMFS is considering rulemaking to authorize Level B harassment takes for the use of only high-frequency sound sources (single-beam and multibeam echosounders and side-scan sonar) to conduct hydrographic surveys (78 Fed. Reg. 1205) and for hydrographic, oceanographic, and meteorologic sampling associated with fisheries research activities (78 Fed. Reg. 25703). The Commission believes NMFS should follow a consistent approach by requiring all applicants to include taking by those types of sources and that the estimated takes by Level B harassment in this application should include the potential for taking by all proposed sound sources.

A recently published report indicated that the use of a 12-kHz multibeam echosounder appears to be the most plausible and likely initial behavioral trigger of the 2008 mass stranding of melon-headed whales in Madagascar (Southall et al. 2013). Southall et al. (2013) indicated that the potential for behavioral responses and indirect injury or mortality from the use of similar multibeam echosounder systems should be considered in future environmental assessments, operational planning, and regulatory decisions. Coincidentally, the same echosounder (the Kongsberg Simrad EM 120) that was used off Madagascar would be used in the proposed survey. However, neither NMFS in its *Federal Register* notice nor NSF and ASC in their application included such information from Southall et al (2013). While they did include information on a 21- to 25-kHz "whale"-finding sonar, a 38-kHz echosounder, and mid-frequency sonar, none of those are comparable to the 12-kHz multibeam echosounder. Based on those data, NMFS indicated in its notice that the brief exposure of marine mammals to one pulse, or small numbers of pulses, from the multibeam echosounder in this particular case would not likely result in harassment of marine mammals. However, that finding did not include data from Southall et al. (2013) and therefore was not based on best available science. For these reasons, the Commission recommends that NMFS (1) require NSF and ASC to revise its take estimates to include Level B harassment takes associated with the use of the single-beam and multibeam echosounder when the airgun array is not firing and (2) follow a consistent approach of requiring the assessment of Level B harassment takes for those types of sound sources (e.g., sub-bottom profilers, echosounders, side-scan sonar, and fish-finding sonar) by all applicants, who propose to use such sources. NMFS did indicate that it is evaluating the broader use of those types of sources to determine under what specific circumstances request 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). The Commission is unsure of the status of that guidance but would welcome a meeting with NMFS to discuss the guidance before it is finalized

In addition, NMFS has categorized sound sources as either impulsive or continuous when determining acoustic criteria and thresholds for Level B harassment (70 Fed. Reg. 1871). However, NMFS's guidance currently does not address the appropriate acoustic threshold for non-impulsive intermittent sound sources. As discussed in previous letters to NMFS regarding shallow penetration sub-bottom profilers, echosounders, and sonars, those sources have temporal and spectral characteristics which suggest that a lower Level B harassment threshold of 120 dB re 1 μPa would be more precautionary than the 160-dB re 1 μPa threshold. In addition, numerous researchers have observed various species of marine mammals, including species similar to those that could be harassed by NSF and ASC, responding to sound from sources (e.g., acoustic deterrent devices,

acoustic harassment devices, pingers) with characteristics similar to those to be used by NSF and ASC and at received levels below 160 dB re 1 μPa (Watkins and Schevill 1975, Olesiuk et al. 1995, Kastelein et al. 1997, Kastelein et al. 2000, Culik et al. 2001, Johnston 2002, Morton and Symonds 2002, Kastelein et al. 2005, Kastelein et al. 2006a and 2006b, Carretta et al. 2008). Until such time that NMFS includes non-impulsive, intermittent sounds in its revised Level B harassment thresholds for behavior, the Commission recommends that NMFS require NSF and ASC to estimate the numbers of marine mammals taken when the single-beam and multibeam echosounders are used in the absence of the airgun array based on the 120- rather than the 160-dB re 1 μPa threshold. The Commission further recommends that NMFS consult with experts in the field of acoustics and marine mammal hearing to revise the Level B harassment thresholds for behavior to specify threshold levels that would be more appropriate for a wider range of sound sources, including shallow penetration sub-bottom profilers, echosounders, and side-scan sonar. The Commission is aware that NMFS is revising its behavior thresholds and recommends that, if NMFS plans to propose behavior thresholds for seismic surveys separate from other activities, NMFS include thresholds for all types of sources that are used during those surveys, not just for airguns.

Monitoring measures

In previous letters, the Commission has indicated that monitoring and reporting requirements should provide a reasonably accurate assessment of the types of taking and the numbers of animals taken by the proposed activity. Those assessments also should 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. Those adjustments are essential for making accurate estimates of the numbers of marine mammals taken during surveys. To be useful, 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 recommends that NMFS consult with the funding agency (i.e., NSF) and individual applicants (e.g., LDEO, Scripps, USGS) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken—the assessment should account for applicable g(0) and f(0) values. NMFS indicated that it was working to develop recommendations for how applicants can correct marine mammal detections appropriately to better estimate the number of animals likely taken during specified activities considering those that are not detected (78 Fed. Reg. 57354). The Commission encourages NMFS to consult with the Commission and NMFS scientists before finalizing such recommendations.

Timely review of application and adequate opportunity for public comment

Section 101(a)(5)(D)(iii) of the MMPA requires that NMFS publish proposed incidental harassment authorizations in the *Federal Register* not later than 45 days after receiving an application and request public comment for a period of 30 days after publication[2]. However, NMFS appears to be developing the practice of cutting short the required comment periods for incidental harassment authorizations. In addition to this case, similar abbreviated comment periods were sought for incidental harassment authorizations proposed for LDEO (in cooperation with Pacific Gas and Electric Company), Apache Alaska Corporation, and TGS-NOPEC Geophysical Company ASA.

[2] www.federalregister.gov/blog/learn/public-inspection-desk-2/table-of-effective-dates-time-periods

The Commission recognizes that staffing limitations, the increasing number of incidental harassment authorization requests, and the complexity of some of those requests often make it difficult for NMFS to meet the 45-day deadline requirement. However, the Commission does not believe that NMFS should shorten public comment periods to offset either longer agency review periods or the time NMFS is waiting for information from the applicant to deem the application complete. Since the ship plans to leave port prior to the close of the comment period, the timeframe in which NMFS would issue the authorization would be curtailed. The abbreviated timeframe appears to undermine the intent of the MMPA to allow for meaningful public input on proposed authorizations, and the Commission does not believe that NMFS should issue authorizations without full consideration of comments received. Therefore, the Commission recommends that NMFS (1) provide a full 30-day public review and comment period that starts with the publication of notices in the printed edition of the *Federal Register* and (2) allow sufficient time after the close of the comment period and prior to issuance of an incidental harassment authorization to allow the agency to analyze, consider, respond to, and make any necessary changes to the proposed authorization or the Service's rationale based on those comments. The time required to conduct an adequate review of comments on a proposed authorization likely will vary depending on the complexity of the authorization, the adequacy of the application and the proposed authorization, the number and diversity of comments received, etc. However, the Commission does not believe that, in most instances, an adequate review can be completed in less than five business days.

The Commission is grateful for the opportunity to provide comments on the application submitted by NSF and ASC. Please contact me if you have questions concerning the Commission's recommendation.

Sincerely,

Rebecca J. Lent, Ph.D.
Executive Director

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

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