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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XE291

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to a Marine Geophysical Survey in the South Atlantic Ocean, January to March 2016

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

ACTION: Notice; issuance of an incidental harassment authorization.

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA) implementing regulations, we hereby give notice that we have issued an Incidental Harassment Authorization (Authorization) to Lamont-Doherty Earth Observatory (Lamont-Doherty), a component of Columbia University, in collaboration with the National Science Foundation (NSF), to take marine mammals, by harassment, in the South Atlantic Ocean, January through March 2016.

DATES: Effective January 4 through March 31, 2016.

ADDRESSES: A copy of the final Authorization and application and other supporting documents are available by writing to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910, by telephoning the contacts listed here, or by visiting the internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm*.

The NSF prepared a draft Environmental Analysis in accordance with Executive Order 12114, "Environmental Effects Abroad of Major Federal Actions" for their proposed federal action. The environmental analysis titled "Environmental Analysis of a Marine Geophysical Survey by the R/V *Marcus G. Langseth* in the South Atlantic Ocean, Austral Summer 2016," prepared by LGL, Ltd. environmental research associates, on behalf of NSF and Lamont-Doherty is available at the same internet address.

NMFS prepared an Environmental Assessment (EA) titled, "Proposed Issuance of an Incidental Harassment Authorization to Lamont-Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the South Atlantic Ocean, January – March 2016," in accordance with NEPA and NOAA Administrative Order 216-6. To obtain an electronic copy of these documents, write to the previously mentioned address, telephone the contact listed here (see **FOR FURTHER INFORMATION CONTACT**), or download the files at: *http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm*.

NMFS also issued a Biological Opinion under section 7 of the Endangered Species Act (ESA) to evaluate the effects of the survey and Authorization on marine species listed as threatened and endangered. The Biological Opinion is available online at: *http://www.nmfs.noaa.gov/pr/consultations/opinions.htm*.

FOR FURTHER INFORMATION CONTACT: Jeannine Cody, NMFS, Office of Protected Resources, NMFS (301) 427-8401.

SUPPLEMENTARY INFORMATION:

Background

Section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended

(MMPA; 16 U.S.C. 1361 *et seq*.) directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if, after NMFS provides a notice of a proposed authorization to the public for review and comment: (1) NMFS makes certain findings; and (2) the taking is limited to harassment.

An Authorization shall be granted for the incidental taking of small numbers of marine mammals if NMFS finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The Authorization must also set forth the permissible methods of taking; other means of effecting the least practicable adverse impact on the species or stock and its habitat (*i.e.*, mitigation); and requirements pertaining to the monitoring and reporting of such taking. NMFS has defined "negligible impact" in 50 CFR 216.103 as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not pertinent here, the MMPA at 16 USC 1362(18)(A) defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Summary of Request

On July 29, 2015, NMFS received an application from Lamont-Doherty requesting that NMFS issue an Authorization for the take of marine mammals, incidental to Texas A&M University and the University of Texas conducting a seismic survey in the South Atlantic Ocean, January through March 2016. Following the initial application submission, Lamont-Doherty submitted a revised application with revised take estimates. NMFS considered the revised application adequate and complete on October 30, 2015.

Lamont-Doherty proposes to conduct a two-dimensional (2-D), seismic survey on the R/V *Marcus G. Langseth* (*Langseth*), a vessel owned by NSF and operated on its behalf by Columbia University's Lamont-Doherty in international waters in the South Atlantic Ocean approximately 1,938 kilometers (km) (1,232 miles [mi]) southeast of the west coast of Brazil for approximately 22 days. The following specific aspect of the proposed activity has the potential to take marine mammals: increased underwater sound generated during the operation of the seismic airgun array. We anticipate that take, by Level B harassment, of 38 species of marine mammals could result from the specified activity. Although unlikely, NMFS also anticipates that a small level of take by Level A harassment of 16 species of marine mammals could occur during the proposed survey.

Description of the Specified Activity

Overview

Lamont-Doherty plans to use one source vessel, the *Langseth*, an array of 36 airguns as the energy source, a receiving system of seven ocean bottom seismometers (OBS), and a single 8-kilometer (km) hydrophone streamer. In addition to the operations of the airguns, Lamont-Doherty intends to operate a multibeam echosounder and a sub-bottom profiler continuously throughout the proposed survey. However, Lamont-Doherty will not operate the multibeam

echosounder and sub-bottom profiler during transits to and from the survey area and in between transits to each of the five OBS tracklines (*i.e.*, when the airguns are not operating).

The purpose of the survey is to collect and analyze seismic refraction data from the Mid-Atlantic Ridge westward to the Rio Grande Rise to study the evolution of the South Atlantic Ocean crust on million-year timescales and the evolution and stability of low-spreading ridges over time. NMFS refers the public to Lamont-Doherty's application (see page 3) for more detailed information on the proposed research objectives.

Dates and Duration

Lamont-Doherty proposes to conduct the seismic survey for approximately 42 days, which includes approximately 22 days of seismic surveying with 10 days of OBS deployment and retrieval. The proposed study (*e.g.*, equipment testing, startup, line changes, repeat coverage of any areas, and equipment recovery) would include approximately 528 hours of airgun operations (*i.e.*, 22 days over 24 hours). Some minor deviation from Lamont-Doherty's requested dates of January through March 2016 is possible, depending on logistics, weather conditions, and the need to repeat some lines if data quality is substandard. Thus, the proposed Authorization, if issued, would be effective from early January through March 31, 2016.

Specified Geographic Region

Lamont-Doherty proposes to conduct the proposed seismic survey in the South Atlantic Ocean, located approximately between 10–35°W, 27–33°S (see Figure 1). Water depths in the survey area range from approximately 1,150 to 4,800 meters (m) (3,773 feet [ft] to 2.98 miles [mi]).

Principal and Collaborating Investigators

The proposed survey's principal investigators are Drs. R. Reece and R. Carlson (Texas A&M University) and Dr. G. Christeson (University of Texas at Austin).

Detailed Description of the Specified Activities

Transit Activities

The *Langseth* would depart and return from Cape Verde and transit to the survey area. Some minor deviations with the transit schedule and port locations are possible depending on logistics and weather.

Vessel Specifications

NMFS outlined the vessel's specifications in the notice of proposed Authorization (80 FR 75355, December 1, 2015). NMFS does not repeat the information here as the vessel's specifications have not changed between the notice of proposed Authorization and this notice of an issued Authorization.

Data Acquisition Activities

NMFS outlined the details regarding Lamont-Doherty's data acquisition activities using the airguns, multibeam echosounder, and the sub-bottom profiler in the notice of proposed Authorization (80 FR 75355, December 1, 2015). NMFS does not repeat the information here as the data acquisition activities have not changed between the notice of proposed Authorization and this notice of an issued Authorization.

For a more detailed description of the authorized action (*i.e.*, vessel and acoustic source specifications, metrics, characteristics of airgun pulses, predicted sound levels of airguns, *etc*.,) please see the notice of proposed Authorization (80 FR 75355, December 1, 2015) and associated documents referenced above this section.

Comments and Responses

NMFS published a notice of receipt of Lamont-Doherty's application and proposed Authorization in the **Federal Register** on December 1, 2015 (80 FR 75355). During the 30-day

public comment period, NMFS received comments from the Marine Mammal Commission (Commission). NMFS has posted the comments online at: *http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm*.

NMFS addresses any comments specific to Lamont-Doherty's application related to the statutory and regulatory requirements or findings that NMFS must make under the MMPA in order to issue an Authorization. The following is a summary of the public comments and NMFS' responses.

Modeling Exclusion and Buffer Zones

Comment 1: The Commission expressed concerns regarding Lamont-Doherty's method to estimate exclusion and buffer zones. It stated that the model is not the best available science because it assumes the following: spherical spreading, constant sound speed, and no bottom interactions. In light of their concerns, the Commission recommended that NMFS require Lamont-Doherty to re-estimate the proposed exclusion and buffer zones incorporating site-specific environmental and operational parameters (*e.g.*, sound speed profiles, refraction, bathymetry/water depth, sediment properties/bottom loss, or absorption coefficients) into their model.

Response: NMFS acknowledges the Commission's concerns about Lamont-Doherty's current modeling approach for estimating exclusion and buffer zones and also acknowledges that Lamont-Doherty did not incorporate site-specific sound speed profiles, bathymetry, and sediment characteristics of the research area in the current approach to estimate those zones for this proposed seismic survey.

Lamont-Doherty's application (LGL, 2015) and the NSF's draft environmental analyses (NSF, 2015) describe the approach to establishing mitigation exclusion and buffer zones. In

summary, Lamont-Doherty acquired field measurements for several array configurations at shallow- and deep-water depths during acoustic verification studies conducted in the northern Gulf of Mexico in 2003 (Tolstoy *et al*., 2004) and in 2007 and 2008 (Tolstoy *et al*., 2009). Based on the empirical data from those studies, Lamont-Doherty developed a sound propagation modeling approach that predicts received sound levels as a function of distance from a particular airgun array configuration in deep water. For this proposed survey, Lamont-Doherty developed the exclusion and buffer zones for the airgun array based on the empirically-derived measurements from the Gulf of Mexico calibration survey (Fig. 5a in Appendix H of the NSF's 2011 PEIS). Based upon the best available information (*i.e*., the three data points, two of which are peer-reviewed, discussed in this response), NMFS finds that the exclusion and buffer zone calculations are appropriate for use in this particular survey.

In 2015, Lamont-Doherty explored solutions to this issue (*i.e*., the question of whether the Gulf of Mexico calibration data adequately informs the model to predict exclusion isopleths in other areas) by conducting a retrospective sound power analysis of one of the lines acquired during Lamont-Doherty's seismic survey offshore New Jersey in 2014 (Crone, 2015). NMFS presented a comparison of the predicted radii (*i.e*., modeled exclusion zones) with radii based on in situ measurements (*i.e*., the upper bound [95th percentile] of the cross-line prediction) in a previous notice of issued Authorization (see Table 1, 80 FR 27635, May 14, 2015) for Lamont-Doherty.

Briefly, Crone's (2015) preliminary analysis, specific to the proposed survey site offshore New Jersey, confirmed that in-situ, site specific measurements and estimates of the 160- and 180-decibel (dB) isopleths collected by the *Langseth's* hydrophone streamer in shallow water were smaller than the modeled (*i.e*., predicted) exclusion and buffer zones proposed for use in

two seismic surveys conducted offshore New Jersey in shallow water in 2014 and 2015. In that particular case, Crone's (2015) results show that Lamont-Doherty's modeled exclusion (180-dB) and buffer (160-dB) zones were approximately 28 and 33 percent smaller than the in situ, site-specific measurements confirming that Lamont-Doherty's model was conservative in that case, as emphasized by Lamont-Doherty in its application and in supporting environmental documentation. The following is a summary of two additional analyses of in-situ data that support Lamont-Doherty's use of the modeled exclusion and buffer zones in this particular case.

In 2010, Lamont-Doherty assessed the accuracy of their modeling approach by comparing the sound levels of the field measurements acquired in the Gulf of Mexico study to their model predictions (Diebold *et al*., 2010). They reported that the observed sound levels from the field measurements fell almost entirely below the predicted mitigation radii curve for deep water (greater than 1,000 meters [m]; 3280.8 feet [ft]) (Diebold *et al*., 2010).

In 2012, Lamont-Doherty used a similar process to model exclusion and buffer zones for a shallow-water seismic survey in the northeast Pacific Ocean offshore Washington in 2012. Lamont-Doherty conducted the shallow-water survey using the same airgun configuration proposed for this seismic survey (*i.e*., 6,600 cubic inches [in^3]) and recorded the received sound levels on the shelf and slope off Washington State using the *Langseth's* 8-kilometer (km) hydrophone streamer. Crone *et al*. (2014) analyzed those received sound levels from the 2012 survey and confirmed that in-situ, site specific measurements and estimates of the 160- and 180-dB isopleths collected by the *Langseth's* hydrophone streamer in shallow water were two to three times smaller than what Lamont-Doherty's modeling approach predicted. While the results confirm bathymetry's role in sound propagation, Crone *et al*. (2014) were able to confirm that the empirical measurements from the Gulf of Mexico calibration survey (the same measurements

used to inform Lamont-Doherty's modeling approach for this seismic survey in the South Atlantic Ocean) overestimated the size of the exclusion and buffer zones for the shallow-water 2012 survey off Washington and were thus precautionary, in that particular case.

The model Lamont-Doherty currently uses does not allow for the consideration of environmental and site-specific parameters as requested by the Commission. NMFS continues to work with Lamont-Doherty and the NSF to address the issue of incorporating site-specific information to further inform the analysis and development of mitigation measures in oceanic and coastal areas for future seismic surveys with Lamont-Doherty. However, Lamont-Doherty's current modeling approach (supported by the three data points discussed previously) represents the best available information for NMFS to reach determinations for the Authorization. As described earlier, the comparisons of Lamont-Doherty's model results and the field data collected in the Gulf of Mexico, offshore Washington, and offshore New Jersey illustrate a degree of conservativeness built into Lamont-Doherty's model for deep water, which NMFS expects to offset some of the limitations of the model to capture the variability resulting from site-specific factors.

Lamont-Doherty has conveyed to NMFS that additional modeling efforts to refine the process and conduct comparative analysis may be possible with the availability of research funds and other resources. Obtaining research funds is typically through a competitive process, including those submitted to U.S. Federal agencies. The use of models for calculating buffer and exclusion zone radii and for developing take estimates is not a requirement of the MMPA incidental take authorization process. Furthermore, NMFS does not provide specific guidance on model parameters nor prescribe a specific model for applicants as part of the MMPA incidental take authorization process at this time. There is a level of variability not only with parameters in

the models, but also the uncertainty associated with data used in models, and therefore, the quality of the model results submitted by applicants. NMFS considers this variability when evaluating applications and the take estimates and mitigation that the model informs. NMFS takes into consideration the model used and its results in determining the potential impacts to marine mammals; however, it is just one component of the analysis during the MMPA consultation process as NMFS also takes into consideration other factors associated with the proposed action, (*e.g.*, geographic location, duration of activities, context, intensity, etc.).

Monitoring and Reporting

Comment 2: 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. They recommend that NMFS and Lamont-Doherty incorporate an accounting for animals at the surface but not detected [*i.e.*, g(0) values] and for animals present but underwater and not available for sighting [*i.e.*, f(0) values] into monitoring efforts. In light of the Commission's previous comments, they recommend that NMFS consult with the funding agency (*i.e.*, the NSF) and individual applicants (*e.g.*, Lamont-Doherty and other related entities) 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, accounting for applicable g(0) and f(0) values. They also recommend that Lamont-Doherty and other relevant entities continue to collect appropriate sightings data in the field which NMFS can then pool to determine g(0) and f(0) values relevant to the various geophysical survey types.

Response: NMFS agrees with the Commission's recommendation to improve the post-survey reporting requirements for NSF and Lamont-Doherty by accounting for takes using

applicable g(0) and f(0) values. In December 2015, NMFS met with Commission representatives to discuss ways to develop and validate 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, accounting for applicable g(0) and f(0) values. We will work with NSF to develop ways to improve their post-survey take estimates and have included a requirement in the South Atlantic Authorization for them to do so in collaboration with us and the Commission.

Description of Marine Mammals in the Area of the Specified Activity

Table 1 in this notice provides the following: all marine mammal species with possible or confirmed occurrence in the proposed activity area; information on those species' regulatory status under the MMPA and the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.); abundance; and occurrence and seasonality in the proposed activity area. Based on the best available information, NMFS expects that there may be a potential for certain cetacean and pinniped species to occur within the survey area (*i.e*., potentially be taken) and have included additional information for these species in Table 1 of this notice. NMFS will carry forward analyses on the species listed in Table 1 later in this document.

Table 1. General information on marine mammals that could potentially occur in the proposed survey areas within the South Atlantic Ocean (January through March 2016).

Species	Regulatory Status[1, 2]	Species Abundance[3]	Local Occurrence and Range[4]	Season[5]
Antarctic minke whale (*Balaenoptera bonaerensis*)	MMPA - NC ESA – NL	515,000[6]	Uncommon shelf, pelagic	Winter
Blue whale (*B. musculus*)	MMPA - D ESA – EN	2,300[7]	Rare coastal, slope, pelagic	Winter
Bryde's whale (*B. edeni*)	MMPA - NC ESA – NL	43,633[8]	Rare coastal, pelagic	Winter
Common (dwarf) minke whale (*B. acutorostrata*)	MMPA -NC ESA – NL	515,000[6]	Uncommon shelf, pelagic	Winter
Fin whale (*B. physalus*)	MMPA - D ESA – EN	22,000[9]	Uncommon Coastal, pelagic	Fall
Humpback whale (*Megaptera novaeangliae*)	MMPA - D ESA – EN	42,000[10]	Uncommon Coastal, shelf, pelagic	Winter
Sei whale	MMPA - D	10,000[11]	Uncommon	Winter

(*B. borealis*)	ESA – EN		Shelf edges, pelagic	
Southern right whale (*Eubalaena australis*)	MMPA - D ESA – EN	12,000[12]	Uncommon Coastal, shelf	Winter
Sperm whale (*Physeter macrocephalus*)	MMPA - D ESA – EN	355,000[13]	Uncommon Slope, pelagic	Winter
Dwarf sperm whale (*Kogia sima*)	MMPA - NC ESA – NL	3,785	Rare Shelf, slope, pelagic	Winter
Pygmy sperm whale (*K. breviceps*)	MMPA - NC ESA – NL	3,785	Rare Shelf, slope, pelagic	Winter
Cuvier's beaked whale (*Ziphius cavirostris*)	MMPA - NC ESA – NL	599,300[14]	Uncommon Slope	Winter
Andrew's beaked whale (*Mesoplodon bowdoini*)	MMPA - NC ESA – NL	599,300[14]	Rare Pelagic	Winter
Arnoux's beaked whale (*Berardius arnuxii*)	MMPA - NC ESA – NL	599,300[14]	Rare Pelagic	Winter
Blainville's beaked whale (*M.densirostris*)	MMPA - NC ESA – NL	599,300[14]	Rare Slope, pelagic	Winter
Gervais' beaked whale (*M. europaeus*)	MMPA - NC ESA – NL	599,300[14]	Rare pelagic	Winter
Gray's beaked whale (*M. grayi*)	MMPA - NC ESA – NL	599,300[14]	Rare Pelagic	Winter
Hector's beaked whale (*M. hectori*)	MMPA - NC ESA – NL	599,300[14]	Rare pelagic	Winter
Shepherd's beaked whale (*Tasmacetus shepherdi*)	MMPA - NC ESA – NL	599,300[14]	Rare pelagic	Winter
Strap-toothed beaked whale (*M. layardii*)	MMPA - NC ESA – NL	599,300[14]	Rare pelagic	Winter
True's beaked whale (*M. mirus*)	MMPA - NC ESA – NL	7,092	Rare pelagic	Winter
Southern bottlenose whale (*Hyperoodon planifrons*)	MMPA - NC ESA – NL	599,300[14]	Rare Coastal, shelf, pelagic	Winter
Bottlenose dolphin (*Tursiops truncatus*)	MMPA - NC ESA – NL	600,000[15]	Uncommon Coastal, pelagic	Winter
Rough-toothed dolphin (*Steno bredanensis*)	MMPA - NC ESA – NL	271	Uncommon shelf, pelagic	Winter
Pantropical spotted dolphin (*Stenella attennuata*)	MMPA - NC ESA – NL	3,333	Uncommon Coastal, slope, pelagic	Winter
Striped dolphin (*S. coeruleoalba*)	MMPA - NC ESA – NL	54,807	Rare Pelagic	Winter
Fraser's dolphin (*Lagenodelphis hosei*)	MMPA - NC ESA – NL	289,000[16]	Uncommon Pelagic	Winter
Spinner dolphin (*Stenella longirostris*)	MMPA - NC ESA – NL	1,200,000[16]	Rare Pelagic	Winter
Atlantic spotted dolphin (*S. frontalis*)	MMPA - NC ESA – NL	44,715	Uncommon Pelagic	Winter
Clymene dolphin (*S. clymene*)	MMPA - NC ESA – NL	6,215	Rare Pelagic	Winter
Risso's dolphin (*Grampus griseus*)	MMPA - NC ESA – NL	20,692	Uncommon Pelagic	Winter
Long-beaked common dolphin (*Delphinus capensis*)	MMPA - NC ESA – NL	20,000[17]	Rare Coastal	Winter
Short-beaked common dolphin (*Delphinus delphis*)	MMPA - NC ESA – NL	173,486	Uncommon Coastal, shelf	Winter
Southern right whale dolphin (*Lissodelphis peronii*)	MMPA - NC ESA – NL	Unknown	Uncommon Coastal, shelf	Winter
Melon-headed whale (*Peponocephala electra*)	MMPA - NC ESA – NL	50,000[18]	Uncommon Coastal, shelf, pelagic	Winter
Pygmy killer whale (*Feresa attenuate*)	MMPA - NC ESA – NL	3,585	Uncommon Coastal, shelf, pelagic	Winter

False killer whale (*Pseudorca crassidens*)	MMPA - NC ESA – NL	442	Rare Pelagic	Winter
Killer whale (Orcinus orca)	MMPA - NC ESA – NL	50,000[19]	Uncommon Coastal, pelagic	Winter
Long-finned pilot whale (*Globicephala melas*)	MMPA - NC ESA – NL	200,000[14]	Uncommon Pelagic	Winter
Short-finned pilot whale (*Globicephala macrorhynchus*)	MMPA - NC ESA – NL	200,000[14]	Uncommon Pelagic	Winter
Southern Elephant Seal (*Mirounga leonina*)	MMPA - NC ESA – NL	650,000[20]	Rare Coastal	Winter
Subantarctic fur seal (*Arctocephalus tropicalis*)	MMPA - NC ESA – NL	310,000[21]	Uncommon Pelagic	Winter

[2] MMPA: NC= Not classified; D= Depleted; ESA: EN = Endangered, T = Threatened, DL = Delisted, NL = Not listed.
[3] Except where noted abundance information obtained from NOAA Technical Memorandum NMFS-NE-231, U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2014 (Waring *et al*., 2015) and the Draft 2015 U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments (*in review*, 2015). NA = Not available.
[4] Occurrence and range information available from the International Union for the Conservation of Nature (IUCN).
[5] NA= Not available due to limited information on that species' seasonal occurrence in the proposed area.
[6] Best estimate from the International Whaling Commission's (IWC) estimate for the minke whale population (Southern Hemisphere, 2004).
[7] Best estimate from the IWC's estimate for the blue whale population (Southern Hemisphere, 1998).
[8] Estimate from IUCN webpage for Bryde's whales. Southern Hemisphere: southern Indian Ocean (13,854); western South Pacific (16,585); and eastern South Pacific (13,194) (IWC, 1981).
[9] Best estimate from the IWC's estimate for the fin whale population (East Greenland to Faroes, 2007).
[10] Best estimate from the IWC's estimate for the humpback whale population (Southern Hemisphere, partial coverage of Antarctic feeding grounds, 2007).
[11] Estimate from the IUCN webpage for sei whales (IWC, 1996).
[12] Best estimate from the IWC's estimate for the southern right whale population (Southern Hemisphere, 2009).
[13] Whitehead, (2002).
[14] Abundance estimates for beaked, southern bottlenose, and pilot whales south of the Antarctic Convergence in January (Kasamatsu and Joyce, 1995).
[15] Wells and Scott, (2009).
[16] Jefferson *et al.*, (2008).
[17] Cockcroft and Peddemors, (1990).
[18] Estimate from the IUCN webpage for melon-headed whales (IUCN, 2015).
[19] Estimate from the IUCN webpage for killer whales (IUCN, 2015).
[20] Estimate from the IUCN webpage for southern elephant seals (IUCN, 2015).
[21] Arnoud, (2009).

NMFS refers the public to Lamont-Doherty's application, NSF's draft environmental analysis (see **ADDRESSES**), NOAA Technical Memorandum NMFS-NE-231, U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2014 (Waring *et al*., 2015); and the Draft 2015 U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments (*in review*, 2015) available online at: *http://www.nmfs.noaa.gov/pr/sars/species.htm* for further information on the biology and local distribution of these species.

Potential Effects of the Specified Activities on Marine Mammals

NMFS provided a summary and discussion of the ways that the types of stressors associated with the specified activity (*e.g.*, seismic airgun operations, vessel movement, and entanglement) impact marine mammals (via observations or scientific studies) in the notice of proposed Authorization (80 FR 75355, December 1, 2015).

The "Estimated Take by Incidental Harassment" section later in this document will include a quantitative discussion of the number of marine mammals anticipated to be taken by this activity. The "Negligible Impact Analysis" section will include the analysis of how this specific proposed activity would impact marine mammals and will consider the content of this section, the "Estimated Take by Incidental Harassment" section, the "Mitigation" section, and the "Anticipated Effects on Marine Mammal Habitat" section to draw conclusions regarding the likely impacts of this activity on the reproductive success or survivorship of individuals and from that on the affected marine mammal populations or stocks.

NMFS provided a background of potential effects of Lamont-Doherty's activities in the notice of proposed Authorization (80 FR 75355, December 1, 2015). Operating active acoustic sources, such as airgun arrays, has the potential for adverse effects on marine mammals. The majority of anticipated impacts would be from the use of acoustic sources. The effects of sounds from airgun pulses might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, and temporary or permanent hearing impairment or non-auditory effects (Richardson *et al.*, 1995). However, for reasons discussed in the notice of proposed Authorization (80 FR 75355, December 1, 2015), it is unlikely that there would be any cases of temporary or permanent hearing impairment resulting from Lamont-Doherty's activities. NMFS' predicted estimates for Level A harassment take for some species are likely overestimates of the injury that will occur. NMFS expects that successful implementation of the required visual and

acoustic mitigation measures would avoid Level A take in some instances.

As outlined in previous NMFS documents, the effects of noise on marine mammals are highly variable, often depending on species and contextual factors (based on Richardson *et al*., 1995).

In the *Potential Effects of the Specified Activity on Marine Mammals* section (80 FR 75355, December 1, 2015); NMFS included a qualitative discussion of the different ways that Lamont-Doherty's seismic survey may potentially affect marine mammals.

Behavior: Marine mammals may behaviorally react to sound when exposed to anthropogenic noise. These behavioral reactions are often shown as: changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where noise sources are located; and/or flight responses (*e.g*., pinnipeds flushing into water from haulouts or rookeries).

Masking: Marine mammals use acoustic signals for a variety of purposes, which differ among species, but include communication between individuals, navigation, foraging, reproduction, avoiding predators, and learning about their environment (Erbe and Farmer, 2000; Tyack, 2000). Introduced underwater sound may through masking reduce the effective communication distance of a marine mammal species if the frequency of the source is close to that of a signal that needs to be detected by the marine mammal, and if the anthropogenic sound is present for a significant fraction of the time (Richardson *et al*., 1995). For the airgun sound generated from Lamont-Doherty's seismic survey, sound will consist of low frequency (under 500 Hz) pulses with extremely short durations (less than one second). Masking from airguns is

more likely in low-frequency marine mammals like mysticetes. There is little concern that masking would occur near the sound source due to the brief duration of these pulses and relative silence between air gun shots (approximately 22 to 170 seconds). The sounds important to small odontocete communication are predominantly at much higher frequencies than the dominant components of airgun sounds, thus limiting the potential for masking in those species.

Hearing Impairment: Hearing impairment (either temporary or permanent) is also unlikely. Given the higher level of sound necessary to cause permanent threshold shift as compared with temporary threshold shift, it is considerably less likely that permanent threshold shift would occur during the seismic survey. Cetaceans generally avoid the immediate area around operating seismic vessels, as do some other marine mammals. Some pinnipeds show avoidance reactions to airguns, but their avoidance reactions are generally not as strong or consistent compared to cetacean reactions. Also, NMFS expects that some individuals would avoid the source at levels expected to result in injury. Nonetheless, although NMFS expects that Level A harassment is unlikely to occur, we have conservatively authorized and analyzed a low level of permanent threshold shift occurrences for certain species. We acknowledge that it is difficult to quantify the degree to which the mitigation and avoidance will reduce the number of animals that might incur permanent threshold shift; however, we are proposing to authorize the modeled number of Level A takes, which does not take the mitigation or avoidance into consideration.

Vessel Movement and Entanglement: The *Langseth* will operate at a relatively slow speed (typically 4.6 knots [8.5 km/h; 5.3 mph]) when conducting the survey. Protected species observers would monitor for marine mammals, which would trigger mitigation measures, including vessel avoidance where safe. Therefore, NMFS does not anticipate nor do we authorize

takes of marine mammals from vessel strike or entanglement.

NMFS refers the reader to Lamont-Doherty's application and the NSF's environmental analysis for additional information on the behavioral reactions (or lack thereof) by all types of marine mammals to seismic vessels. NMFS has reviewed these data and based our decision on the relevant information.

Anticipated Effects on Marine Mammal Habitat

NMFS included a detailed discussion of the potential effects of this action on marine mammal habitat, including physiological and behavioral effects on marine mammal prey items (*e.g.*, fish and invertebrates) in the notice of proposed Authorization (80 FR 75355, December 1, 2015). While NMFS anticipates that the specified activity may result in marine mammals avoiding certain areas due to temporary ensonification, the impact to habitat is temporary and reversible. Further, NMFS also considered these impacts to marine mammals in detail in the notice of proposed Authorization as behavioral modification. The main impact associated with the activity would be temporarily elevated noise levels and the associated direct effects on marine mammals.

Mitigation

In order to issue an Incidental Harassment Authorization under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (where relevant).

Lamont-Doherty has reviewed the following source documents and has incorporated a

suite of proposed mitigation measures into their project description.

(1) Protocols used during previous Lamont-Doherty and NSF-funded seismic research cruises as approved by us and detailed in the NSF's 2011 PEIS and 2015 draft environmental analysis;

(2) Previous incidental harassment authorizations applications and authorizations that NMFS has approved and authorized; and

(3) Recommended best practices in Richardson *et al*. (1995), Pierson *et al*. (1998), and Weir and Dolman, (2007).

To reduce the potential for disturbance from acoustic stimuli associated with the activities, Lamont-Doherty, and/or its designees have proposed to implement the following mitigation measures for marine mammals:

(1) Vessel-based visual mitigation monitoring;

(2) Proposed exclusion zones;

(3) Power down procedures;

(4) Shutdown procedures;

(5) Ramp-up procedures; and

(6) Speed and course alterations.

NMFS reviewed Lamont-Doherty's proposed mitigation measures and has proposed an additional measure to effect the least practicable adverse impact on marine mammals. They are:

(1) Expanded power down procedures for concentrations of six or more whales that do not appear to be traveling (*e.g.*, feeding, socializing, etc.).

Vessel-based Visual Mitigation Monitoring

Lamont-Doherty would position observers aboard the seismic source vessel to watch for

marine mammals near the vessel during daytime airgun operations and during any start-ups at night. Observers would also watch for marine mammals near the seismic vessel for at least 30 minutes prior to the start of airgun operations after an extended shutdown (*i.e.*, greater than approximately eight minutes for this proposed cruise). When feasible, the observers would conduct observations during daytime periods when the seismic system is not operating for comparison of sighting rates and behavior with and without airgun operations and between acquisition periods. Based on the observations, the *Langseth* would power down or shutdown the airguns when marine mammals are observed within or about to enter a designated exclusion zone for cetaceans or pinnipeds.

During seismic operations, at least four protected species observers would be aboard the *Langseth*. Lamont-Doherty would appoint the observers with NMFS concurrence, and they would conduct observations during ongoing daytime operations and nighttime ramp-ups of the airgun array. During the majority of seismic operations, two observers would be on duty from the observation tower to monitor marine mammals near the seismic vessel. Using two observers would increase the effectiveness of detecting animals near the source vessel. However, during mealtimes and bathroom breaks, it is sometimes difficult to have two observers on effort, but at least one observer would be on watch during bathroom breaks and mealtimes. Observers would be on duty in shifts of no longer than four hours in duration.

Two observers on the *Langseth* would also be on visual watch during all nighttime ramp-ups of the seismic airguns. A third observer would monitor the passive acoustic monitoring equipment 24 hours a day to detect vocalizing marine mammals present in the action area. In summary, a typical daytime cruise would have scheduled two observers (visual) on duty from the observation tower, and an observer (acoustic) on the passive acoustic monitoring system. Before

the start of the seismic survey, Lamont-Doherty would instruct the vessel's crew to assist in detecting marine mammals and implementing mitigation requirements.

The *Langseth* is a suitable platform for marine mammal observations. When stationed on the observation platform, the eye level would be approximately 21.5 m (70.5 ft) above sea level, and the observer would have a good view around the entire vessel. During daytime, the observers would scan the area around the vessel systematically with reticle binoculars (*e.g.*, 7 x 50 Fujinon), Big-eye binoculars (25 x 150), and with the naked eye. During darkness, night vision devices would be available (ITT F500 Series Generation 3 binocular-image intensifier or equivalent), when required. Laser range-finding binoculars (Leica LRF 1200 laser rangefinder or equivalent) would be available to assist with distance estimation. They are useful in training observers to estimate distances visually, but are generally not useful in measuring distances to animals directly. The user measures distances to animals with the reticles in the binoculars.

Lamont-Doherty would immediately power down or shutdown the airguns when observers see marine mammals within or about to enter the designated exclusion zone. The observer(s) would continue to maintain watch to determine when the animal(s) are outside the exclusion zone by visual confirmation. Airgun operations would not resume until the observer has confirmed that the animal has left the zone, or if not observed after 15 minutes for species with shorter dive durations (small odontocetes and pinnipeds) or 30 minutes for species with longer dive durations (mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, killer, and beaked whales).

Lamont-Doherty would use safety radii to designate exclusion zones and to estimate take for marine mammals. Table 2 shows the distances at which one would expect to receive sound levels (160-, 180-, and 190-dB,) from the airgun array and a single airgun. If the protected

species visual observer detects marine mammal(s) within or about to enter the appropriate exclusion zone, the *Langseth* crew would immediately power down the airgun array, or perform a shutdown if necessary (see Shut-down Procedures).

Table 2. Predicted distances to which sound levels greater than or equal to 160 re: 1 µPa could be received during the proposed survey areas within the South Atlantic Ocean (January through March, 2016).

Source and Volume (in^3)	Tow Depth (m)	Water Depth (m)	Predicted RMS Distances[1] (m)		
			190 dB	180 dB	160 dB
Single Bolt airgun (40 in^3)	9	> 1,000	100	100	388
36-Airgun Array (6,600 in^3)	9	> 1,000	286	927	5,780

[1] Predicted distances based on information presented in Lamont-Doherty's application.

The 180- or 190-dB level shutdown criteria are applicable to cetaceans and pinnipeds respectively as specified by NMFS (2000). Lamont-Doherty used these levels to establish the exclusion zones as presented in their application.

Power Down Procedures

A power down involves decreasing the number of airguns in use such that the radius of the 180-dB or 190-dB exclusion zone is smaller to the extent that marine mammals are no longer within or about to enter the exclusion zone. A power down of the airgun array can also occur when the vessel is moving from one seismic line to another. During a power down for mitigation, the *Langseth* would operate one airgun (40 in^3). The continued operation of one airgun would alert marine mammals to the presence of the seismic vessel in the area. A shutdown occurs when the *Langseth* suspends all airgun activity.

If the observer detects a marine mammal outside the exclusion zone and the animal is likely to enter the zone, the crew would power down the airguns to reduce the size of the 180-dB or 190-dB exclusion zone before the animal enters that zone. Likewise, if a mammal is already

within the zone after detection, the crew would power-down the airguns immediately. During a power down of the airgun array, the crew would operate a single 40-in^3 airgun which has a smaller exclusion zone. If the observer detects a marine mammal within or near the smaller exclusion zone around the airgun (Table 3), the crew would shut down the single airgun (see next section).

Resuming Airgun Operations after a Power Down

Following a power-down, the *Langseth* crew would not resume full airgun activity until the marine mammal has cleared the 180-dB or 190-dB exclusion zone. The observers would consider the animal to have cleared the exclusion zone if:

- The observer has visually observed the animal leave the exclusion zone; or
- An observer has not sighted the animal within the exclusion zone for 15 minutes for species with shorter dive durations (*i.e.*, small odontocetes or pinnipeds), or 30 minutes for species with longer dive durations (*i.e.*, mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, and beaked whales); or

The *Langseth* crew would resume operating the airguns at full power after 15 minutes of sighting any species with short dive durations (*i.e.*, small odontocetes or pinnipeds). Likewise, the crew would resume airgun operations at full power after 30 minutes of sighting any species with longer dive durations (*i.e.*, mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, and beaked whales).

NMFS estimates that the *Langseth* would transit outside the original 180-dB or 190-dB exclusion zone after an 8-minute wait period. This period is based on the average speed of the *Langseth* while operating the airguns (8.5 km/h; 5.3 mph). Because the vessel has transited away from the vicinity of the original sighting during the 8-minute period, implementing ramp-up

procedures for the full array after an extended power down (*i.e.*, transiting for an additional 35 minutes from the location of initial sighting) would not meaningfully increase the effectiveness of observing marine mammals approaching or entering the exclusion zone for the full source level and would not further minimize the potential for take. The *Langseth's* observers are continually monitoring the exclusion zone for the full source level while the mitigation airgun is firing. On average, observers can observe to the horizon (10 km; 6.2 mi) from the height of the *Langseth's* observation deck and should be able to say with a reasonable degree of confidence whether a marine mammal would be encountered within this distance before resuming airgun operations at full power.

Shutdown Procedures

The *Langseth* crew would shut down the operating airgun(s) if they see a marine mammal within or approaching the exclusion zone for the single airgun. The crew would implement a shutdown:

(1) If an animal enters the exclusion zone of the single airgun after the crew has initiated a power down; or

(2) If an observer sees the animal is initially within the exclusion zone of the single airgun when more than one airgun (typically the full airgun array) is operating.

Resuming Airgun Operations after a Shutdown: Following a shutdown in excess of eight minutes, the *Langseth* crew would initiate a ramp-up with the smallest airgun in the array (40-in^3). The crew would turn on additional airguns in a sequence such that the source level of the array would increase in steps not exceeding 6 dB per five-minute period over a total duration of approximately 30 minutes. During ramp-up, the observers would monitor the exclusion zone, and if he/she sees a marine mammal, the *Langseth* crew would implement a power down or

shutdown as though the full airgun array were operational.

During periods of active seismic operations, there are occasions when the *Langseth* crew would need to temporarily shut down the airguns due to equipment failure or for maintenance. In this case, if the airguns are inactive longer than eight minutes, the crew would follow ramp-up procedures for a shutdown described earlier and the observers would monitor the full exclusion zone and would implement a power down or shutdown if necessary.

If the full exclusion zone is not visible to the observer for at least 30 minutes prior to the start of operations in either daylight or nighttime, the *Langseth* crew would not commence ramp-up unless at least one airgun (40-in^3 or similar) has been operating during the interruption of seismic survey operations. Given these provisions, it is likely that the vessel's crew would not ramp up the airgun array from a complete shutdown at night or in thick fog, because the outer part of the zone for that array would not be visible during those conditions.

If one airgun has operated during a power down period, ramp-up to full power would be permissible at night or in poor visibility, on the assumption that marine mammals would be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away. The vessel's crew would not initiate a ramp-up of the airguns if an observer sees the marine mammal within or near the applicable exclusion zones during the day or close to the vessel at night.

Ramp-up Procedures

Ramp-up of an airgun array provides a gradual increase in sound levels, and involves a step-wise increase in the number and total volume of airguns firing until the full volume of the airgun array is achieved. The purpose of a ramp-up is to "warn" marine mammals in the vicinity of the airguns, and to provide the time for them to leave the area and thus avoid any potential

injury or impairment of their hearing abilities. Lamont-Doherty would follow a ramp-up procedure when the airgun array begins operating after an 8 minute period without airgun operations or when shut down has exceeded that period. Lamont-Doherty has used similar waiting periods (approximately eight to 10 minutes) during previous seismic surveys.

Ramp-up would begin with the smallest airgun in the array (40 in^3). The crew would add airguns in a sequence such that the source level of the array would increase in steps not exceeding six dB per five minute period over a total duration of approximately 30 to 35 minutes. During ramp-up, the observers would monitor the exclusion zone, and if marine mammals are sighted, Lamont-Doherty would implement a power-down or shut-down as though the full airgun array were operational.

If the complete exclusion zone has not been visible for at least 30 minutes prior to the start of operations in either daylight or nighttime, Lamont-Doherty would not commence the ramp-up unless at least one airgun (40 in^3 or similar) has been operating during the interruption of seismic survey operations. Given these provisions, it is likely that the crew would not ramp up the airgun array from a complete shut-down at night or in thick fog, because the outer part of the exclusion zone for that array would not be visible during those conditions. If one airgun has operated during a power-down period, ramp-up to full power would be permissible at night or in poor visibility, on the assumption that marine mammals would be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away. Lamont-Doherty would not initiate a ramp-up of the airguns if an observer sights a marine mammal within or near the applicable exclusion zones.

Special Procedures for Concentrations of Large Whales

The *Langseth* would avoid exposing concentrations of large whales to sounds greater

than 160 dB re: 1 µPa within the 160-dB zone and would power down the array, if necessary. For purposes of this proposed survey, a concentration or group of whales would consist of six or more individuals visually sighted that do not appear to be traveling (*e.g.*, feeding, socializing, etc.).

Speed and Course Alterations

If during seismic data collection, Lamont-Doherty detects marine mammals outside the exclusion zone and, based on the animal's position and direction of travel, is likely to enter the exclusion zone, the *Langseth* would change speed and/or direction if this does not compromise operational safety. Due to the limited maneuverability of the primary survey vessel, altering speed, and/or course can result in an extended period of time to realign the *Langseth* to the transect line. However, if the animal(s) appear likely to enter the exclusion zone, the *Langseth* would undertake further mitigation actions, including a power down or shut down of the airguns.

Mitigation Conclusions

NMFS has carefully evaluated Lamont-Doherty's proposed mitigation measures in the context of ensuring that we prescribe the means of effecting the least practicable impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another:

- The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals;
- The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and
- The practicability of the measure for applicant implementation.

Any mitigation measure(s) prescribed by NMFS should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed here:

1. Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).

2. A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

3. A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

4. A reduction in the intensity of exposures (either total number or number at biologically important time or location) to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing the severity of harassment takes only).

5. Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time.

6. For monitoring directly related to mitigation—an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on the evaluation of Lamont-Doherty's proposed measures, as well as other measures proposed by NMFS (*i.e.*, special procedures for concentrations of large whales), NMFS has determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammal species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring

In order to issue an Incidental Harassment Authorization for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for Authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that we expect to be present in the proposed action area.

Lamont-Doherty submitted a marine mammal monitoring plan in section XIII of the Authorization application. NMFS, NSF, or Lamont-Doherty may modify or supplement the plan based on comments or new information received from the public during the public comment period.

Monitoring measures prescribed by NMFS should accomplish one or more of the following general goals:

1. An increase in the probability of detecting marine mammals, both within the mitigation zone (thus allowing for more effective implementation of the mitigation) and during other times and locations, in order to generate more data to contribute to the analyses mentioned later;

2. An increase in our understanding of how many marine mammals would be affected by seismic airguns and other active acoustic sources and the likelihood of associating those exposures with specific adverse effects, such as behavioral harassment, temporary or permanent threshold shift;

3. An increase in our understanding of how marine mammals respond to stimuli that we expect to result in take and how those anticipated adverse effects on individuals (in different ways and to varying degrees) may impact the population, species, or stock (specifically through effects on annual rates of recruitment or survival) through any of the following methods:

a. Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (*i.e.*, to be able to accurately predict received level, distance from source, and other pertinent information);

b. Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (*i.e.*, to be able to accurately predict received level, distance from source, and other pertinent information);

c. Distribution and/or abundance comparisons in times or areas with concentrated stimuli versus times or areas without stimuli;

4. An increased knowledge of the affected species; and

5. An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

Monitoring Measures

Lamont-Doherty proposes to sponsor marine mammal monitoring during the present project to supplement the mitigation measures that require real-time monitoring, and to satisfy the monitoring requirements of the Authorization. Lamont-Doherty understands that NMFS

would review the monitoring plan and may require refinements to the plan. Lamont-Doherty planned the monitoring work as a self-contained project independent of any other related monitoring projects that may occur in the same regions at the same time. Further, Lamont-Doherty is prepared to discuss coordination of its monitoring program with any other related work that might be conducted by other groups working insofar as it is practical for Lamont-Doherty.

Vessel-Based Passive Acoustic Monitoring

Passive acoustic monitoring would complement the visual mitigation monitoring program, when practicable. Visual monitoring typically is not effective during periods of poor visibility or at night, and even with good visibility, is unable to detect marine mammals when they are below the surface or beyond visual range. Passive acoustic monitoring can improve detection, identification, and localization of cetaceans when used in conjunction with visual observations. The passive acoustic monitoring would serve to alert visual observers (if on duty) when vocalizing cetaceans are detected. It is only useful when marine mammals call, but it can be effective either by day or by night, and does not depend on good visibility. The acoustic observer would monitor the system in real time so that he/she can advise the visual observers if they acoustically detect cetaceans.

The passive acoustic monitoring system consists of hardware (*i.e.*, hydrophones) and software. The "wet end" of the system consists of a towed hydrophone array connected to the vessel by a tow cable. The tow cable is 250 m (820.2 ft) long and the hydrophones are fitted in the last 10 m (32.8 ft) of cable. A depth gauge, attached to the free end of the cable, typically is towed at depths less than 20 m (65.6 ft). The *Langseth* crew would deploy the array from a winch located on the back deck. A deck cable would connect the tow cable to the electronics unit

in the main computer lab where the acoustic station, signal conditioning, and processing system would be located. The Pamguard software amplifies, digitizes, and then processes the acoustic signals received by the hydrophones. The system can detect marine mammal vocalizations at frequencies up to 250 kHz.

One acoustic observer, an expert bioacoustician with primary responsibility for the passive acoustic monitoring system would be aboard the *Langseth* in addition to the other visual observers who would rotate monitoring duties. The acoustic observer would monitor the towed hydrophones 24 hours per day during airgun operations and during most periods when the *Langseth* is underway while the airguns are not operating. However, passive acoustic monitoring may not be possible if damage occurs to both the primary and back-up hydrophone arrays during operations. The primary passive acoustic monitoring streamer on the *Langseth* is a digital hydrophone streamer. Should the digital streamer fail, back-up systems should include an analog spare streamer and a hull-mounted hydrophone.

One acoustic observer would monitor the acoustic detection system by listening to the signals from two channels via headphones and/or speakers and watching the real-time spectrographic display for frequency ranges produced by cetaceans. The observer monitoring the acoustical data would be on shift for one to six hours at a time. The other observers would rotate as an acoustic observer, although the expert acoustician would be on passive acoustic monitoring duty more frequently.

When the acoustic observer detects a vocalization while visual observations are in progress, the acoustic observer on duty would contact the visual observer immediately, to alert him/her to the presence of cetaceans (if they have not already been seen), so that the vessel's crew can initiate a power down or shutdown, if required. The observer would enter the

information regarding the call into a database. Data entry would include an acoustic encounter identification number, whether it was linked with a visual sighting, date, time when first and last heard and whenever any additional information was recorded, position and water depth when first detected, bearing if determinable, species or species group (*e.g*., unidentified dolphin, sperm whale), types and nature of sounds heard (*e.g*., clicks, continuous, sporadic, whistles, creaks, burst pulses, strength of signal, etc.), and any other notable information. Acousticians record the acoustic detection for further analysis.

Observer Data and Documentation

Observers would record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. They would use the data to help better understand the impacts of the activity on marine mammals and to estimate numbers of animals potentially 'taken' by harassment (as defined in the MMPA). They will also provide information needed to order a power down or shut down of the airguns when a marine mammal is within or near the exclusion zone.

When an observer makes a sighting, they will record the following information:

1. Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic vessel, sighting cue, apparent reaction to the airguns or vessel (*e.g*., none, avoidance, approach, paralleling, etc.), and behavioral pace.

2. Time, location, heading, speed, activity of the vessel, sea state, visibility, and sun glare.

The observer will record the data listed under (2) at the start and end of each observation watch, and during a watch whenever there is a change in one or more of the variables.

Observers will record all observations and power downs or shutdowns in a standardized format and will enter data into an electronic database. The observers will verify the accuracy of the data entry by computerized data validity checks during data entry and by subsequent manual checking of the database. These procedures will allow the preparation of initial summaries of data during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical, and other programs for further processing and archiving.

Results from the vessel-based observations will provide:

1. The basis for real-time mitigation (airgun power down or shutdown).

2. Information needed to estimate the number of marine mammals potentially taken by harassment, which Lamont-Doherty must report to the Office of Protected Resources.

3. Data on the occurrence, distribution, and activities of marine mammals and turtles in the area where Lamont-Doherty would conduct the seismic study.

4. Information to compare the distance and distribution of marine mammals and turtles relative to the source vessel at times with and without seismic activity.

5. Data on the behavior and movement patterns of marine mammals detected during non-active and active seismic operations.

Reporting

Lamont-Doherty would submit a report to us and to NSF within 90 days after the end of the cruise. The report would describe the operations conducted and sightings of marine mammals near the operations. The report would provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report would summarize the dates and locations of seismic operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities). The report would also include estimates of the

number and nature of exposures that occurred above the harassment threshold based on the observations. The report would consider both published literature and previous monitoring results that could inform the detectability of different species and how that information affects post survey exposure estimates.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner not permitted by the authorization (if issued), such as an injury, serious injury, or mortality (*e.g.*, ship-strike, gear interaction, and/or entanglement), Lamont-Doherty shall immediately cease the specified activities and immediately report the take to the Division Chief, Permits and Conservation Division, Office of Protected Resources, NMFS. The report must include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and

- Photographs or video footage of the animal(s) (if equipment is available).

Lamont-Doherty shall not resume its activities until we are able to review the circumstances of the prohibited take. We shall work with Lamont-Doherty to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Lamont-Doherty may not resume their activities until notified by us via letter, email, or telephone.

In the event that Lamont-Doherty discovers an injured or dead marine mammal, and the lead visual observer determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.*, in less than a moderate state of decomposition as we describe in the next paragraph), Lamont-Doherty will immediately report the incident to the Division Chief, Permits and Conservation Division, Office of Protected Resources, NMFS. The report must include the same information identified in the paragraph above this section. Activities may continue while NMFS reviews the circumstances of the incident. NMFS would work with Lamont-Doherty to determine whether modifications in the activities are appropriate.

In the event that Lamont-Doherty discovers an injured or dead marine mammal, and the lead visual observer determines that the injury or death is not associated with or related to the authorized activities (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), Lamont-Doherty would report the incident to the Chief Permits and Conservation Division, Office of Protected Resources, NMFS, within 24 hours of the discovery. Lamont-Doherty would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS.

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Acoustic stimuli (*i.e.*, increased underwater sound) generated during the operation of the airgun array may have the potential to result in the behavioral disturbance of some marine mammals and may have an even smaller potential to result in permanent threshold shift (non-lethal injury) of some marine mammals. NMFS expects that the proposed mitigation and monitoring measures would minimize the possibility of injurious or lethal takes. However, NMFS cannot discount the possibility (*albeit small*) that exposure to energy from the proposed survey could result in non-lethal injury (Level A harassment). Thus, NMFS proposes to authorize take by Level B harassment and Level A harassment resulting from the operation of the sound sources for the proposed seismic survey based upon the current acoustic exposure criteria shown in Table 3 subject to the limitations in take described in Table 5 later in this notice.

Table 3 – NMFS' Current Acoustic Exposure Criteria

Criterion	Criterion Definition	Threshold
Level A Harassment (Injury)	Permanent Threshold Shift (PTS) (Any level above that which is known to cause TTS)	180 dB re 1 microPa-m (cetaceans) / 190 dB re 1 microPa-m (pinnipeds) root mean square (rms)
Level B Harassment	Behavioral Disruption (for impulse noises)	160 dB re 1 microPa-m (rms)

NMFS' practice is to apply the 160 dB re: 1 μPa received level threshold for underwater impulse sound levels to predict whether behavioral disturbance that rises to the level of Level B

harassment is likely to occur. NMFS' practice is to apply the 180 dB or 190 dB re: 1 μPa received level threshold for underwater impulse sound levels to predict whether permanent threshold shift (auditory injury), which we consider as Level A harassment is likely to occur.

Acknowledging Uncertainties in Estimating Take

Given the many uncertainties in predicting the quantity and types of impacts of sound on marine mammals, it is common practice to estimate how many animals are likely to be present within a particular distance of a given activity, or exposed to a particular level of sound, and use that information to predict how many animals are taken. In practice, depending on the amount of information available to characterize daily and seasonal movement and distribution of affected marine mammals, distinguishing between the numbers of individuals harassed and the instances of harassment can be difficult to parse. Moreover, when one considers the duration of the activity, in the absence of information to predict the degree to which individual animals are likely exposed repeatedly on subsequent days, the simple assumption is that entirely new animals are exposed every day, which results in a take estimate that in some circumstances overestimates the number of individuals harassed.

The following sections describe NMFS' methods to estimate take by incidental harassment. We base these estimates on the number of marine mammals that could be potentially harassed by seismic operations with the airgun array during approximately 3,236 km (2,028 mi) of transect lines in the South Atlantic Ocean.

Modeled Number of Instances of Exposures: Lamont-Doherty would conduct the proposed seismic survey within the high seas in the South Atlantic Ocean. NMFS presents estimates of the anticipated numbers of instances that marine mammals could be exposed to sound levels greater than or equal to 160, 180, and 190 dB re: 1 μPa during the proposed seismic

survey. Table 5 represents the numbers of instances of take that NMFS proposes to authorize for this survey within the South Atlantic Ocean.

NMFS' Take Estimate Method for Species with Density Information: In order to estimate the potential number of instances that marine mammals could be exposed to airgun sounds above the 160-dB Level B harassment threshold and the 180-dB Level A harassment thresholds, NMFS used the following approach for species with density estimates derived from the Navy's Atlantic Fleet Training and Testing Navy Marine Species Density Database (NMSDD) maps for the survey area in the Southern Atlantic Ocean. NMFS used the highest density range for each species within the survey area.

(1) Calculate the total area that the *Langseth* would ensonify above the 160-dB Level B harassment threshold and above the 180-dB Level A harassment threshold for cetaceans within a 24-hour period. This calculation includes a daily ensonified area of approximately 1,377 square kilometers (km^2) (532 square miles [mi^2]) for the five OBS tracklines and 1,839 km^2 (710 mi^2) for the MCS trackline based on the *Langseth* traveling approximately 150 km [93 mi] in one day). Generally, the *Langseth* travels approximately 137 km (85 mi) in one day while conducting a seismic survey; thus, NMFS' estimate of a daily ensonified area based on 150 km is an estimation of the theoretical maximum that the *Langseth* could travel within 24 hours.

(2) Multiply each daily ensonified area above the 160-dB Level B harassment threshold by the species' density (animals/km^2) to derive the predicted number of instances of exposures to received levels greater than or equal to 160-dB re: 1 μPa on a given day;

(3) Multiply each product (*i.e.*, the expected number of instances of exposures within a day) by the number of survey days that includes a 25 percent contingency (*i.e.*, a total of six days for the five OBS tracklines and a total of 22 days for the MCS trackline) to derive the predicted

number of instances of exposures above 160 dB over the duration of the survey;

(4) Multiply the daily ensonified area by each species-specific density to derive the predicted number of instances of exposures to received levels greater than or equal to 180-dB re: 1 μPa for cetaceans on a given day (*i.e.*, Level A takes). This calculation includes a daily ensonified area of approximately 207 km^2 (80 mi^2) for the five OBS tracklines and 281 km^2 (108 mi^2) for the MCS trackline.

(5) Multiply each product by the number of survey days that includes a 25 percent contingency (*i.e.*, a total of six days for the five OBS tracklines and a total of 22 days for the MCS trackline). Subtract that product from the predicted number of instances of exposures to received levels greater than or equal to 160-dB re: 1 μPa on a given day to derive the number of instances of exposures estimated to occur between 160 and 180-dB threshold (*i.e.*, Level B takes).

In many cases, this estimate of instances of exposures is likely an overestimate of the number of individuals that are taken, because it assumes 100 percent turnover in the area every day, (*i.e.*, that each new day results in takes of entirely new individuals with no repeat takes of the same individuals over the 22-day period (28 days with contingency). It is difficult to quantify to what degree this method overestimates the number of individuals potentially taken. Except as described later for a few specific species, NMFS uses this number of instances as the estimate of individuals (and authorized take) even though NMFS is aware that the number may be somewhat high due to the use of the maximum density estimate from the NMSDD.

Take Estimates for Species with Less than One Instance of Exposure: Using the approach described earlier, the model generated instances of take for some species that were less than one over the 28-day duration. Those species include the humpback, blue, Bryde's, pygmy sperm, and

dwarf sperm whale. NMFS used data based on dedicated survey sighting information from the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, and 2013 (AMAPPS, 2010, 2011, 2013) to estimate take and assumed that Lamont-Doherty could potentially encounter one group of each species during the proposed seismic survey. NMFS believes it is reasonable to use the average (mean) group size (weighted by effort and rounded up) from the AMMAPS surveys for humpback whale (3), blue whale (2), Bryde's whale (2), pygmy sperm whale (2), and dwarf sperm whale (2) to derive a reasonable estimate of take for eruptive occurrences.

Take Estimates for Species with No Density Information: Density information for the Southern right whale, southern elephant seal, and Subantarctic fur seal in the South Atlantic Ocean is data poor or non-existent. When density estimates were not available, NMFS used data based on dedicated survey sighting information from the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, and 2013 (AMAPPS, 2010, 2011, 2013) to estimate take for the three species. NMFS assumed that Lamont-Doherty could potentially encounter one group of each species during the seismic survey. NMFS believes it is reasonable to use the average (mean) group size (weighted by effort and rounded up) for North Atlantic right whales (3) from the AMMAPS surveys for the Southern right whale and the mean group size for unidentified seals (2) from the AMMAPS surveys for southern elephant and Subantarctic fur seals multiplied by 28 days to derive an estimate of take from a potential encounter.

NMFS used sighting information from a survey off Namibia, Africa (Rose and Payne, 1991) to estimate a mean group size for southern right whale dolphins (58) and also multiplied

that estimate by 28 days to derive an estimate of take from a potential encounter with that species.

Table 4. Densities and/or mean group size, and estimates of the possible numbers of marine mammals and population percentages exposed to sound levels greater than or equal to 160, 180, and 190 dB re: 1 µPa over 28 days during the proposed seismic survey in the South Atlantic Ocean (January through March, 2016).

Species	Density Estimate[1]	Modeled Number of Instances of Exposures to Sound Levels ≥ 160, 180, and 190 dB[2]	Proposed Level A Take[3]	Proposed Level B Take[3]	Percent of Population[4]	Population Trend[5]
Antarctic minke whale	0.054983	2,276, 396, -	396	2,276	0.519	Unknown
Blue whale	0.000032	2, 0, -	0	2	0.074	Unknown
Bryde's whale	0.000262	2, 0, -	0	2	0.005	Unknown
Common minke whale	0.054983	2,276, 396, -	396	2,276	0.519	Unknown
Fin whale	0.002888	106, 28, -	28	106	0.609	Unknown
Humpback whale	0.000078	3, 0, -	0	3	0.200	↑
Sei whale	0.002688	106, 28, -	28	106	1.340	Unknown
Southern right whale	NA	18, 0, -	0	18	0.150	Unknown
Sperm whale	0.001214	50, 0, -	0	50	0.014	Unknown
Dwarf sperm whale	0.000041	2, 0, -	0	2	0.053	Unknown
Pygmy sperm whale	0.000021	2, 0, -	0	2	0.053	Unknown
Cuvier's beaked whale	0.003831	156, 28, -	28	156	0.031	Unknown
Andrew's beaked whale	0.000511	28, 0, -	0	28	0.005	Unknown
Arnoux's beaked whale	0.000956	28, 0, -	0	28	0.005	Unknown
Blainville's beaked whale	0.000663	28, 0, -	0	28	0.005	Unknown
Gervais' beaked whale	0.001334	56, 0, -	0	56	0.009	Unknown
Gray's beaked whale	0.000944	28, 0, -	0	28	0.005	Unknown
Hector's beaked whale	0.000246	0, 0, -	0	0	0.000	Unknown
Shepherd's beaked whale	0.000816	28, 0, -	0	28	0.005	Unknown
Strap-toothed beaked whale	0.000638	28, 0, -	0	28	0.005	Unknown
True's beaked whale	0.000876	28, 0, -	0	28	0.005	Unknown
Southern bottlenose whale	0.000917	28, 0, -	0	28	0.005	Unknown
Bottlenose dolphin	0.020744	848, 156, -	156	848	0.167	Unknown
Rough-toothed dolphin	0.000418	22, 0, -	0	22	8.118	Unknown
Pantropical spotted dolphin	0.003674	156, 28, -	28	156	5.521	Unknown
Striped dolphin	0.174771	7,208, 1,294, -	1,294	7,208	15.513	Unknown
Fraser's dolphin	0.001568	56, 0, -	0	56	0.019	Unknown
Spinner dolphin	0.006255	262, 50, -	50	262	0.026	Unknown
Atlantic spotted dolphin	0.077173	3,180, 580 -	580	3,180	8.409	Unknown
Clymene dolphin	0.000258	0, 0, -	0	0	0.000	Unknown
Risso's dolphin	0.037399	1,540, 290, -	290	1,540	8.844	Unknown
Long-beaked common dolphin	0.000105	0, 0, -	0	0	0.000	Unknown
Short-beaked common dolphin	0.129873	5,356, 954, -	954	5,356	3.637	Unknown
Southern right whale dolphin	NA	1,624, 0, -	0	1,624	Unknown	Unknown
Melon-headed whale	0.006285	262, 50, -	50	262	0.624	Unknown
Pygmy killer whale	0.001039	50, 0, -	0	50	1.395	Unknown
False killer whale	0.000158	0, 0, -	0	0	0.000	Unknown
Killer whale	0.003312	134, 28, -	28	134	0.324	Unknown
Long-finned pilot whale	0.007614	318, 56, -	56	318	0.187	Unknown
Short-finned pilot whale	0.015616	636, 106, -	106	636	0.371	Unknown
Southern Elephant Seal	NA	56, 0, 0	0	56	0.009	Unknown
Subantarctic fur seal	NA	56, 0, 0	0	56	0.018	Unknown

[1] Densities (where available) are expressed as number of individuals per km^2. Densities estimated from the Navy's Atlantic Fleet Training and Testing Navy Marine Species Density Database maps for the survey area in the Southern Atlantic Ocean. NA = Not available.

[2] See preceding text for information on NMFS' take estimate calculations. NA = Not applicable.

[3] Modeled instances of exposures include adjustments for species with no density information. The Level A estimates are overestimates of predicted impacts to marine mammals as the estimates do not take into consideration the required mitigation

measures for shutdowns or power downs if a marine mammal is likely to enter the 180 dB exclusion zone while the airguns are active.
[4] Table 2 in this notice lists the stock species abundance estimates used in calculating the percentage of the population.
[5] Population trend information from Waring *et al*., 2015. ↑= Increasing. ↓ = Decreasing. Unknown = Insufficient data.

Lamont-Doherty did not estimate any additional take from sound sources other than airguns. NMFS does not expect the sound levels produced by the echosounder and sub-bottom profiler to exceed the sound levels produced by the airguns. Lamont-Doherty will not operate the multibeam echosounder and sub-bottom profiler during transits to and from the survey area, (*i.e*., when the airguns are not operating) and in between transits to each of the five OBS tracklines, and, therefore, NMFS does not anticipate additional takes from these sources in this particular case.

NMFS considers the probability for entanglement of marine mammals as low because of the vessel speed and the monitoring efforts onboard the survey vessel. Therefore, NMFS does not believe it is necessary to authorize additional takes for entanglement at this time.

The *Langseth* will operate at a relatively slow speed (typically 4.6 knots [8.5 km/h; 5.3 mph]) when conducting the survey. Protected species observers would monitor for marine mammals, which would trigger mitigation measures, including vessel avoidance where safe. Therefore, NMFS does not anticipate nor do we authorize takes of marine mammals from vessel strike.

There is no evidence that the planned survey activities could result in serious injury or mortality within the specified geographic area for the requested proposed Authorization. The required mitigation and monitoring measures would minimize any potential risk for serious injury or mortality.

Analysis and Determinations

Negligible Impact

Negligible impact is "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival'' (50 CFR 216.103). The lack of likely adverse effects on annual rates of recruitment or survival (*i.e*., population level effects) forms the basis of a negligible impact finding. Thus, an estimate of the number of takes, alone, is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through behavioral harassment, NMFS must consider other factors, such as the likely nature of any responses (their intensity, duration, etc.), the context of any responses (critical reproductive time or location, migration, etc.), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, effects on habitat, and the status of the species.

In making a negligible impact determination, NMFS considers:

- The number of anticipated injuries, serious injuries, or mortalities;
- The number, nature, and intensity, and duration of harassment; and
- The context in which the takes occur (*e.g*., impacts to areas of significance, impacts to local populations, and cumulative impacts when taking into account successive/contemporaneous actions when added to baseline data);
- The status of stock or species of marine mammals (*i.e*., depleted, not depleted, decreasing, increasing, stable, impact relative to the size of the population);
- Impacts on habitat affecting rates of recruitment/survival; and
- The effectiveness of monitoring and mitigation measures to reduce the number or

severity of incidental takes.

To avoid repetition, our analysis applies to all the species listed in Table 5, given that NMFS expects the anticipated effects of the seismic airguns to be similar in nature. Where there are meaningful differences between species or stocks, or groups of species, in anticipated individual responses to activities, impact of expected take on the population due to differences in population status, or impacts on habitat, NMFS has identified species-specific factors to inform the analysis.

Given the required mitigation and related monitoring, NMFS does not anticipate that serious injury or mortality would occur as a result of Lamont-Doherty's proposed seismic survey in the South Atlantic Ocean. Thus the proposed authorization does not authorize any mortality.

NMFS' predicted estimates for Level A harassment take for some species are likely overestimates of the injury that will occur. NMFS expects that successful implementation of the required visual and acoustic mitigation measures would avoid Level A take in some instances. Also, NMFS expects that some individuals would avoid the source at levels expected to result in injury. Nonetheless, although NMFS expects that Level A harassment is unlikely to occur at the numbers proposed to be authorized, because it is difficult to quantify the degree to which the mitigation and avoidance will reduce the number of animals that might incur PTS, we are proposing to authorize, and have included in our analyses, the modeled number of Level A takes, which does not take the mitigation or avoidance into consideration. However, because of the constant movement of the *Langseth* and the animals, as well as the fact that the boat is not staying in any one area in which individuals would be expected to concentrate for any long amount of time (*i.e.*, since the duration of exposure to loud sounds will be relatively short), we

anticipate that any PTS incurred would be in the form of only a small degree of permanent threshold shift and not total deafness.

Of the marine mammal species under our jurisdiction that are known to occur or likely to occur in the study area, the following species are listed as endangered under the ESA: blue, fin, humpback, sei, Southern right whale, and sperm whales. The western north Atlantic population of humpback whales is known to be increasing. The other marine mammal species that may be taken by harassment during Lamont-Doherty's seismic survey program are not listed as threatened or endangered under the ESA.

Cetaceans. Odontocete reactions to seismic energy pulses are usually thought to be limited to shorter distances from the airgun(s) than are those of mysticetes, in part because odontocete low-frequency hearing is assumed to be less sensitive than that of mysticetes. Given sufficient notice through relatively slow ship speed, NMFS generally expects marine mammals to move away from a noise source that is annoying prior to becoming potentially injurious, although Level A takes for a small group of species are proposed for authorization here.

Potential impacts to marine mammal habitat were discussed previously in this document (see the "Anticipated Effects on Habitat" section). Although some disturbance is possible to food sources of marine mammals, the impacts are anticipated to be minor enough as to not affect annual rates of recruitment or survival of marine mammals in the area. Based on the size of the South Atlantic Ocean where feeding by marine mammals occurs versus the localized area of the marine survey activities, any missed feeding opportunities in the direct project area will be minor based on the fact that other feeding areas exist elsewhere. Taking into account the planned mitigation measures, effects on cetaceans are generally expected to be restricted to avoidance of a limited area around the survey operation and short-term changes in behavior, falling within the

MMPA definition of "Level B harassment." Animals are not expected to permanently abandon any area that is surveyed, and any behaviors that are interrupted during the activity are expected to resume once the activity ceases. Only a small portion of marine mammal habitat will be affected at any time, and other areas within the South Atlantic Ocean would be available for necessary biological functions.

Pinnipeds. During foraging trips, extralimital pinnipeds may not react at all to the sound from the proposed survey, ignore the stimulus, change their behavior, or avoid the immediate area by swimming away or diving. Behavioral responses can range from a mild orienting response, or a shifting of attention, to flight and panic. Research and observations show that pinnipeds in the water are tolerant of anthropogenic noise and activity. They may react in a number of ways depending on their experience with the sound source and what activity they are engaged in at the time of the exposure. Significant behavioral effects are more likely at higher received levels within a few kilometers of the source and activities involving sound from the proposed survey would not occur near any haulout areas where resting behaviors occur.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (*i.e.*, 24 hour cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.*, 2007). While NMFS anticipates that the seismic operations would occur on consecutive days and the duration of the survey would last no more than 28 days, the seismic operations would increase sound levels in the marine environment in a relatively small area surrounding the vessel (compared to the range of most of the marine mammals within the proposed survey area), which

is constantly travelling over distances, and some animals may only be exposed to and harassed by sound for less than a day.

For reasons stated previously in this document and based on the following factors, Lamont-Doherty's specified activities are not likely to cause long-term behavioral disturbance, serious injury, or death, or other effects that would be expected to adversely affect reproduction or survival of any individuals. They include:

- The anticipated impacts of Lamont-Doherty's survey activities on marine mammals are temporary behavioral changes due, primarily, to avoidance of the area;
- The likelihood that, given the constant movement of boat and animals and the nature of the survey design (not concentrated in areas of high marine mammal concentration), PTS incurred would be of a low level;
- The availability of alternate areas of similar habitat value for marine mammals to temporarily vacate the survey area during the operation of the airgun(s) to avoid acoustic harassment;
- The expectation that the seismic survey would have no more than a temporary and minimal adverse effect on any fish or invertebrate species that serve as prey species for marine mammals, and therefore consider the potential impacts to marine mammal habitat minimal; and
- The knowledge that the survey is taking place in the open ocean and not located within an area of biological importance for breeding, calving, or foraging for marine mammals.

Table 4 in this document outlines the number of requested Level A and Level B harassment takes that we anticipate as a result of these activities.

Required mitigation measures, such as special shutdowns for large whales, vessel speed, course alteration, and visual monitoring would be implemented to help reduce impacts to marine

mammals. Based on the analysis herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS finds that Lamont-Doherty's proposed seismic survey would have a negligible impact on the affected marine mammal species or stocks.

Small Numbers

As mentioned previously, NMFS estimates that Lamont-Doherty's activities could potentially affect, by Level B harassment, 38 species of marine mammals under our jurisdiction. NMFS estimates that Lamont-Doherty's activities could potentially affect, by Level A harassment, up to 16 species of marine mammals under our jurisdiction.

For each species, the numbers of take being proposed for authorization are small numbers relative to the population sizes: less than 16 percent for striped dolphins, less than 8 percent of Risso's dolphins, less than 6 percent for pantropical spotted dolphins, and less than 4 percent for all other species. NMFS has provided the regional population and take estimates for the marine mammal species that may be taken by Level A and Level B harassment in Table 4 in this notice. NMFS finds that the proposed incidental take described in Table 4 for the proposed activity would be limited to small numbers relative to the affected species or stocks.

Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses

There are no relevant subsistence uses of marine mammals implicated by this action.

Endangered Species Act (ESA)

There are six marine mammal species listed as endangered under the Endangered Species Act that may occur in the proposed survey area. Under section 7 of the ESA, NSF initiated formal consultation with NMFS on the proposed seismic survey. NMFS (*i.e.*, National Marine Fisheries Service, Office of Protected Resources, Permits and Conservation Division) also

consulted internally with NMFS on the proposed issuance of an Authorization under section 101(a)(5)(D) of the MMPA.

In January, 2016, the Endangered Species Act Interagency Cooperation Division issued a Biological Opinion with an Incidental Take Statement to us and to the NSF, which concluded that the issuance of the Authorization and the conduct of the seismic survey were not likely to jeopardize the continued existence of blue, fin, humpback, sei, South Atlantic right and sperm whales. The Biological Opinion also concluded that the issuance of the Authorization and the conduct of the seismic survey would not affect designated critical habitat for these species.

National Environmental Policy Act (NEPA)

NSF has prepared an environmental analysis titled "*Environmental Analysis of a Marine Geophysical Survey by the R/V Marcus G. Langseth in South Atlantic Ocean, Austral Summer 2016.*" NMFS has also prepared an environmental assessment (EA) titled, "Proposed Issuance of an Incidental Harassment Authorization to Lamont Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the South Atlantic Ocean, January – March 2016," which tiers off of NSF's environmental analysis. NMFS and NSF provided relevant environmental information to the public through the notice of proposed Authorization (80 FR 75355, December 1, 2015) and considered public comments received prior to finalizing our EA and deciding whether or not to issue a Finding of No Significant Impact (FONSI). NMFS concluded that issuance of an Incidental Harassment Authorization to Lamont-Doherty would not significantly affect the quality of the human environment and prepared and issued a FONSI in accordance with NEPA and NOAA Administrative Order 216-6. NMFS' EA and FONSI for this activity are available upon request (see **ADDRESSES**).

Authorization

NMFS has issued an Incidental Harassment Authorization to Lamont-Doherty for the take of marine mammals, incidental to conducting a marine seismic survey in the South Atlantic Ocean January through March 2016.

Dated: January 11, 2016.

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Perry F. Gayaldo,

Deputy Director, Office of Protected Resources,

National Marine Fisheries Service.

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