



**BILLING CODE 3510-22-P**

**DEPARTMENT OF COMMERCE**

**National Oceanic and Atmospheric Administration**

**RTID 0648-XR069**

**Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to THwaites Offshore Research (THOR) Project in the Amundsen Sea, Antarctica.**

**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 regulations implementing the Marine Mammal Protection Act (MMPA) as amended, notification is hereby given that NMFS has issued an incidental harassment authorization (IHA) to the National Science Foundation (NSF) Office of Polar Programs on behalf of the University of Houston to incidentally harass, by Level B harassment only, marine mammals during a low-energy marine geophysical survey in the Amundsen Sea, Antarctica.

**DATES:** This Authorization is effective for one year from the January 24, 2020.

**FOR FURTHER INFORMATION CONTACT:** Bonnie DeJoseph, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: <https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act>. In case of problems accessing these documents, please call the contact listed above.

## **SUPPLEMENTARY INFORMATION:**

### **Background**

The MMPA prohibits the “take” of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed incidental take authorization may be provided to the public for review.

Authorization for incidental takings shall be granted 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 taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other “means of effecting the least practicable adverse impact” on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as “mitigation”); and requirements pertaining to the mitigation, monitoring and reporting of the takings.

The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

### **Summary of Request**

On July 24, 2019, NMFS received a request from NSF for an IHA to take marine mammals incidental to conducting a low-energy marine geophysical survey and icebreaking as

necessary in the Amundsen Sea. The application was deemed adequate and complete on November 22, 2019. NSF's request is for take of small numbers of 18 species of marine mammals, by harassment. Neither NSF nor NMFS expects serious injury or mortality to result from this activity and, therefore, an IHA is appropriate. The planned activity is not expected to exceed one year.

### **Description of Planned Activity**

NSF plans to conduct a low-energy marine seismic survey in the Amundsen Sea during February 2020. The survey will complement Thwaites Glacier and other Amundsen Sea oceanographic and geological/geophysical studies and provide reference data that can be used to initiate and evaluate the reliability of ocean models. Data obtained by the project would assist in establishing boundary conditions seaward of the Thwaites Glacier grounding line, obtaining records of external drivers of change, improving knowledge of processes leading to the collapse of Thwaites Glacier, and determining the history of past change in grounding line migration and conditions at the glacier base.

Seismic surveys will be conducted over approximately 8400 square kilometers (km<sup>2</sup>) between 75.25°-73.5° S and 101.0°-108.5°W of the Amundsen Sea for approximately eight days beginning on or about February 6, 2020. Sixty-five percent of data acquisition will occur in intermediate depths (100-1000 meters (m)) and 35 percent in deep waters (1000-< 2000 m). The surveys will involve one source vessel, the Research Vessel/Icebreaker (RVIB) *Nathaniel B. Palmer* (*Palmer*). NSF has stated the possibility of deploying multiple configurations of generator injector (GI) airgun(s) with one 100-300 m, solid-state, hydrophone streamer towed behind the *Palmer*. If the preferred airgun configuration (two 45/105 cubic inch (in<sup>3</sup>) gun array in true GI mode does not provide data to meet scientific objectives, alternate configurations

would be utilized (Table 1). All possible configurations will be towed at a depth of 3 m with a total maximum discharge volume for the largest, two-airgun array of 420 in<sup>3</sup> along predetermined track lines, approximately 1600 km. Because of the extent of sea ice in the Amundsen Sea that typically occurs between January and February annually, icebreaking activities are expected to be required during the cruise.

**Table 1 -- Proposed Seismic Survey Activities in the Amundsen Sea<sup>1</sup>**

<b>Configuration</b>	<b>Airgun Array Total Volume (GI configuration)</b>	<b>Frequency Between Seismic Shots</b>	<b>Streamer Length</b>
Preferred	2 x 45/105 in <sup>3</sup> (300 in <sup>3</sup> total) (true GI mode)	5 seconds	100-300 m  (328-984 ft)
Alternate 1	1 x 45/105 in <sup>3</sup> (150 in <sup>3</sup> total) (true GI mode)	5 seconds	
Alternate 2 (used for take request)	2 x 105/105 in <sup>3</sup> (420 in <sup>3</sup> total) (harmonic mode)	5 seconds	
Alternate 3	1 x 105/105 in <sup>3</sup> (210 in <sup>3</sup> total) (harmonic mode)	5 seconds	

<sup>1</sup> Seismic surveying operations are planned for 1600 km (994 mi) in length.

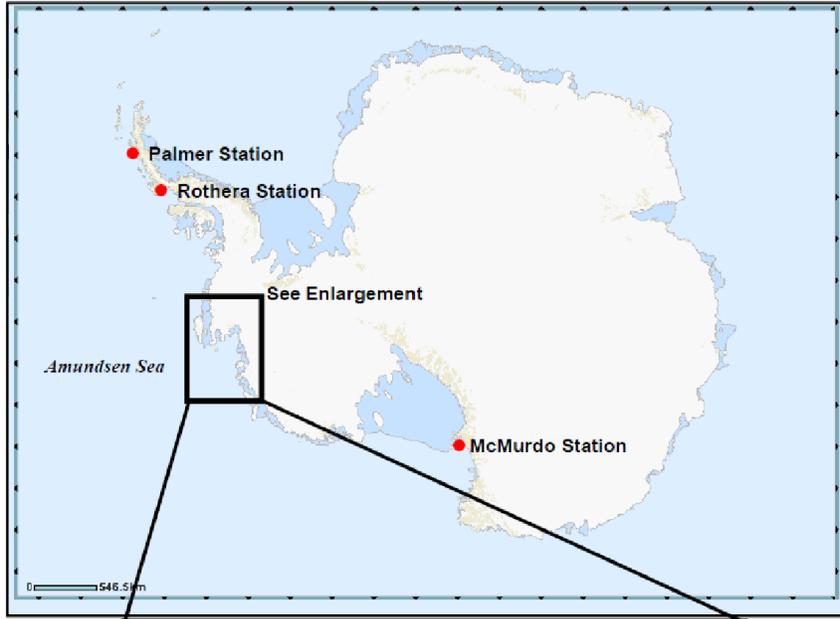
In addition to the operations of the airgun array, a hull-mounted Single Beam Echo Sounder (Knudsen 3260 CHIRP), Multibeam Sonar (Kongsberg EM122), Acoustic Doppler Current Profiler (ADCP) (Teledyne RDI VM-150 or Ocean Surveyor OS-38), as well as EK biological echo sounder (Simrad ES200-7C, ES38B, ES-120-7C) will also be operated from the *Palmer* during the cruise.

A detailed description of the planned THOR project was provided in the **Federal Register** notice for the proposed IHA published on December 19, 2019 ([84 FR 69950](#)). Since

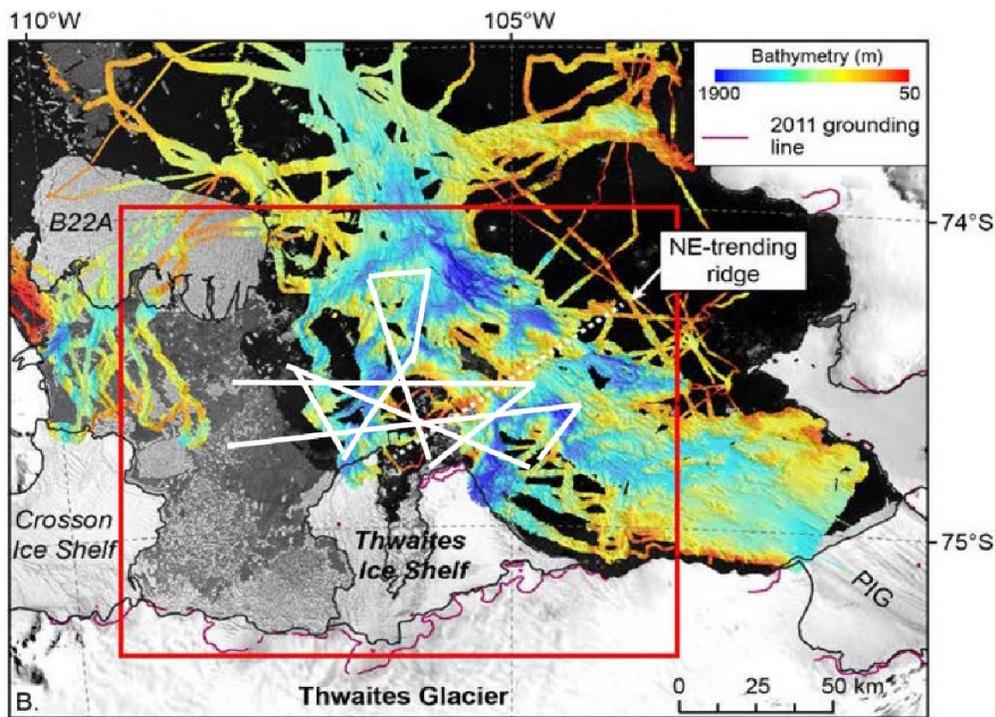
that time, no changes have been made to the planned survey activities. Therefore, a detailed description is not provided here. Please refer to that **Federal Register** notice for the description of the specific activity.

Mitigation, monitoring, and reporting measures are described in detail later in this document (please see **Mitigation** and **Monitoring and Reporting**).

**Figure 1 – Amundsen Sea Study Area**



**Note:** Thwaites Glacier study area (red box) and approximate seismic survey lines (white line



within box).

Source: Scambos *et al.* 2017 in *Global and Planetary Change*.

## Comments and Responses

A notice of NMFS's proposal to issue an IHA to NSF was published in the **Federal Register** on December 19, 2019 ([84 FR 69950](#)). That notice described, in detail, NSF's activity, the marine mammal species that may be affected by the activity, and the anticipated effects on marine mammals. During the 30-day public comment period, NMFS received a comment letter from the Marine Mammal Commission (Commission). For full detail of the Commission's recommendations and supporting rationale, please see the letter (available online at: [www.fisheries.noaa.gov/action/incidental-take-authorization-thwaites-offshore-research-thor-project-amundsen-sea-antartica](http://www.fisheries.noaa.gov/action/incidental-take-authorization-thwaites-offshore-research-thor-project-amundsen-sea-antartica)).

*Comment:* The Commission recommends that NMFS: (1) specify whether NSF's activities would occur in international waters, the deepest water depth in which the geophysical survey would occur, and the parameters and methods used to estimate the Level B harassment zone for ice-breaking activities; (2) use the humpback whale density of 0.001365 whales/km<sup>2</sup> based on Gohl (2010) to re-estimate the numbers of takes for the geophysical survey and ice-breaking activities; (3)(a) revise the (i) Level A and B harassment zones for the geophysical survey based on a tow depth of 4 m rather than 3 m or restrict the airguns from being towed at a depth of more than 3 m and (ii) ensonified areas for Level B harassment based on transiting 200 km rather than 160 km per day during the geophysical survey and (b) use the total ensonified area for Level B harassment to re-estimate the numbers of takes for the geophysical survey; and (4) increase the numbers of Level B harassment takes to at least 3 blue whales, 40 humpback whales, 40 killer whales, 2,000 crabeater seals, 100 Weddell seals, 50 leopard seals, and 10 Ross seals based on group size and documented occurrence in the Amundsen Sea.

*Response:* NSF has confirmed that the survey will occur entirely within international waters, and that the maximum survey depth is 1,900 m. The parameters and methods used to

estimate the Level B harassment zone for ice-breaking activities are described in the “Estimated Take” section later in this document. Regarding humpback whale density, NMFS concurs with the Commission and has produced revised exposure estimates using the recommended density value (see “Estimated Take,” later in this document). NSF intends to tow the acoustic source at a depth of 3 m; therefore, this value was used in modeling of the acoustic harassment isopleths. NMFS also concurs with the Commission regarding the daily transit distance of 200 km and has revised the exposure estimates accordingly. Similarly, exposure estimate calculations have been performed using the total ensonified area, as recommended by the Commission.

Regarding the recommendation to increase certain authorized take numbers on the basis of expected group size encounters, NMFS concurs with the Commission and has made the recommended adjustments, with two exceptions. NMFS disagrees with the Commission regarding the likelihood of encountering a group of three blue whales, and has retained the initial estimate of two. Blue whales, a rarely encountered species, are typically encountered as single animals or as small groups of up to 2 or 3 animals. Therefore, the estimate of two blue whale takes is sufficient to account for likely group size. For killer whales, we revisited the available information and derived a more appropriate density value on the basis of available observational data (as described below under “Changes from the Proposed IHA to Final IHA”). The revised exposure estimate exceeds the Commission’s recommended group size estimate.

*Comment:* Regarding ice-breaking, the Commission recommends that NMFS use the total ensonified area of 8,491 km<sup>2</sup> to estimate the numbers of Level B harassment takes if ice-breaking activities could occur on any of the survey days, or use the reduced ensonified area of 7,409 km<sup>2</sup> to estimate the numbers of Level B harassment takes if ice-breaking activities are expected to occur for two straight days.

*Response:* The maximum estimated amount of icebreaking expected by NSF, *i.e.*, 445 km for the maximum of 48 hours, was used in our calculations to avoid the significant overestimation that would result from assuming icebreaking will occur every day (10 survey days, including 2 contingency days). It is unlikely that any given animal would experience the stressor continuously for 10 days, and the potential effects of ice-breaking have been appropriately accounted for in NMFS' authorized take levels.

*Comment:* The Commission recommends that NMFS (1) include a requirement to extrapolate Level B harassment takes to the unobserved portions of the Level B harassment zone and (2) ensure that NSF keeps a running tally of total Level B harassment takes based on both observed and extrapolated takes.

*Response:* NMFS agrees that NSF must ensure they do not exceed authorized takes. As is typical in such authorizations, we have included a requirement that NSF report "estimates of the number and nature of exposures that occurred above the harassment threshold based on PSO observations, including an estimate of those that were not detected."

*Comment:* The Commission recommends that NMFS require NSF to either (1) re-estimate the proposed Level A and B harassment zones and associated takes of marine mammals using (a) both operational and site-specific environmental parameters, (b) a comprehensive source model and (c) an appropriate sound propagation model for the proposed incidental harassment authorization; or (2) collect or provide the relevant acoustic data to substantiate that its modeling approach is conservative for both deep and intermediate waters beyond the Gulf of Mexico. The Commission further recommends that NMFS (1) explain why it believes that sound channels with downward refraction, as well as seafloor reflections, are not likely to occur during the geophysical survey; (2) specify the degree to which both of those parameters would affect the

estimation (or underestimation) of Level B harassment zones in deep and intermediate water; (3) explain why it believes that NSF's model and other 'modeling' approaches provide more accurate, realistic, and appropriate Level A and B harassment zones than approaches favored by the Commission, particularly for deep and intermediate water; and (4) explain, if NSF's model and other 'modeling' approaches are considered best available science, why other action proponents that conduct seismic surveys are not implementing similar methods particularly given their simplicity.

*Response:* As noted by the Commission, these comments reflect a longstanding disagreement between NMFS and the Commission regarding NSF's approach to modeling the output of their acoustic sources and its propagation through the water column. NMFS has previously responded to the Commission's comments on NSF's modeling approach. We refer the reader to previous **Federal Register** notices providing responses rather than repeat them here (e.g., 84 FR 60059, November 07, 2019; 84 FR 54849, October 11, 2019; 84 FR 35073, July 22, 2019). However, given the Commission's continuing concerns with NSF's modeling approach for its broader survey program (and not solely for the subject survey), NMFS also will engage separately with the Commission about these issues.

*Comment:* The Commission recommends that NMFS post on its website the same day a notice of proposed authorization publishes in the **Federal Register** the application, the draft incidental harassment authorization, any hydroacoustic or marine mammal monitoring plans, its list of references, previous monitoring reports, and any other related documents.

*Response:* NMFS concurs with the recommendation.

*Comment:* The Commission reiterates programmatic recommendations regarding NMFS' potential use of the renewal mechanism for one-year IHAs.

*Response:* NMFS disagrees with the Commission's recommendations, as stated in our previous comment responses relating to other actions, which we incorporate here by reference (e.g., 84 FR 52464; October 02, 2019).

### **Changes from the Proposed IHA to Final IHA**

Corrections have been made to the estimated take table (see Table 9), as well as population (see Table 2) values updated and density (see Table 7) values corrected for two and three species, respectively. More recent sources were found for the population abundance of crabeater and Weddell seals. Bengston *et al.* (2011) reported 2,100,000 crabeater seals in the Ross and Amundsen Sea, which is more relevant to NSF's survey in the Amundsen Sea than Boyd's (2002) report of 5,000,000 seals in the entire Antarctic. For Weddell seals, Hückstädt updated their population estimate from 750,000 (2015) to 1,000,000 (2018) seals.

We re-evaluated the density values and found that the Protected Species Observer Report from a previous NSF Antarctic cruise (Mehle *et al.* 2015) had higher monitoring/observation counts for minke and killer whales. Thus, the higher Mehle *et al.* (2015) counts were used for a more conservative take estimate than those used in the proposed IHA; *i.e.*, Ainley *et al.* (2007) for minke whales and NMSDD (2012) for killer whales. Since both the Ainley *et al.* (2007) and Mehle *et al.* (2015) monitoring efforts were conducted from the same vessel, the *Palmer*, in Antarctica, NMFS used the same calculation method as NSF with the Ainley *et al.* (2007) data. Therefore, the 1.6 km visual transect width and 556 km survey distance were used to produce the area surveyed, 889.6 km<sup>2</sup>, which allowed the calculation of the density area.

### **Description of Marine Mammals in the Area of Specified Activities**

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially

affected species. Additional information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS’s website (<https://www.fisheries.noaa.gov/find-species>).

The populations of marine mammals considered in this document do not occur within the U.S. Exclusive Economic Zone (EEZ) and are therefore not assigned to stocks and are not assessed in NMFS’ Stock Assessment Reports (SAR). As such, information on potential biological removal (PBR; defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population) and on annual levels of serious injury and mortality from anthropogenic sources are not available for these marine mammal populations. Abundance estimates for marine mammals in the survey location are based on a variety of sources including International Whaling Commission population estimates (IWC 2019), The International Union for Conservation of Nature’s (IUCN) Red List of Threatened Species, and various literature estimates (see IHA application for further detail), as this is considered the best available information on potential abundance of marine mammals in the area.

Table 2 lists all species with expected potential for occurrence in the Amundsen Sea, Antarctica, and summarizes information related to the population, including regulatory status under the MMPA and ESA. For taxonomy, we follow the Committee on Taxonomy (2019).

**Table 2 -- Marine Mammal Species Potentially Present in the Project Area Expected To Be Affected by the Specified Activities**

Common name	Scientific name	Stock <sup>1</sup>	ESA/MMPA status; Strategic (Y/N) <sup>2</sup>	Stock abundance	PBR
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)					
Family Balaenopteridae (rorquals)					

Blue whale	<i>Balaenoptera musculus</i>	N/A	E/D;Y	5,000 <sup>3</sup>	N/A
Fin whale	<i>Balaenoptera physalus</i>	N/A	E/D;Y	38,200 <sup>4</sup>	N/A
Humpback whale	<i>Megaptera novaeangliae</i>	N/A	-	42,000 <sup>5</sup>	N/A
Common (dwarf) minke whale	<i>Balaenoptera acutorostrata</i>	N/A	-	257,500 <sup>6</sup>	N/A
Antarctic minke whale	<i>Balaenoptera bonaerensis</i>	N/A	-	257,500 <sup>6</sup>	N/A
Sei whale	<i>Balaenoptera borealis</i>	N/A	E	10,000 <sup>7</sup>	N/A
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)					
Family Physeteridae					
Sperm whale	<i>Physeter macrocephalus</i>	N/A	E	12,069 <sup>8</sup>	N/A
Family Ziphiidae (beaked whales)					
Arnoux's beaked whale	<i>Berardius arnuxii</i>	N/A	-	599,300 <sup>9</sup>	N/A
Gray's beaked whale	<i>Mesoplodon grayi</i>	N/A	-	599,300 <sup>9</sup>	N/A
Layard's beaked whales	<i>Mesoplodon layardii</i>	N/A	-	599,300 <sup>9</sup>	N/A
Southern bottlenose	<i>Hyperoodon planifrons</i>	N/A	-	500,000 <sup>10</sup>	N/A
Family Delphinidae					
Killer whale	<i>Orcinus orca</i>	N/A	-	25,000 <sup>11</sup>	N/A
Long-finned whale	<i>Globicephala macrorhynchus</i>	N/A	-	200,000 <sup>12</sup>	N/A
Family Phocidae (earless seals)					
Crabeater seal	<i>Lobodon carcinophaga</i>	N/A	-	2,100,000 <sup>13</sup>	N/A
Leopard seal	<i>Hydrurga leptonyx</i>	N/A	-	222,000 <sup>14</sup>	N/A
Southern elephant seal	<i>Mirounga leonina</i>	N/A	-	750,000 <sup>15</sup>	N/A
Ross seal	<i>Ommatophoca rossii</i>	N/A	-	250,000 <sup>16</sup>	N/A
Weddell seal	<i>Leptonychotes weddellii</i>	N/A	-	1,000,000 <sup>17</sup>	N/A

N.A. = data not available

<sup>1</sup> The populations of marine mammals considered in this document do not occur within the U.S. EEZ and are therefore not assigned to stocks.

<sup>2</sup> Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

<sup>3</sup> Antarctic Range 5-8,000 (Cooke 2018)

<sup>4</sup> Aguilar & García-Vernet 2018

<sup>5</sup> Partial coverage of Antarctic feeding grounds (IWC 2019)

<sup>6</sup> Split of undifferentiated minke whale population abundance, total of 515,000 in the Southern Hemisphere (IWC 2019)

<sup>7</sup> Cooke 2018

<sup>8</sup> Estimate for the Antarctic, south of 60° S (Whitehead 2002)

<sup>9</sup> All beaked whales south of the Antarctic Convergence; mostly southern bottlenose whales (Kasamatsu & Joyce 1995)

<sup>10</sup> Jefferson *et al.* 2008

<sup>11</sup> Branch & Butterworth 2001

<sup>12</sup> Antarctic (Boyd 2002)

<sup>13</sup> Ross and Amundsen Sea (Bengston *et al.*, 2011)

<sup>14</sup>Global population is 222,000 - 440,000 (Rogers 2018)

<sup>15</sup>Total world population (Hindell *et al.*, 2016)

<sup>16</sup>Hückstädt 2015

<sup>17</sup>Hückstädt 2018

All species that could potentially occur in the planned survey areas are included in Table 2. As described below, all 18 species temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur, and we have authorized it.

A detailed description of the of the species likely to be affected by the THOR geophysical survey, including brief introductions to the species and relevant stocks as well as available information regarding population trends and threats, information regarding local occurrence, and marine mammal hearing were provided in the **Federal Register** notice for the proposed IHA (84 FR 69950; December 19, 2019). Since that time, we are not aware of any changes in the status of these species and stocks; therefore, detailed descriptions are not provided here. Please refer to that **Federal Register** notice for these descriptions.

### **Potential Effects of Specified Activities on Marine Mammals and their Habitat**

The effects of underwater noise from NSF's planned geophysical survey have the potential to result in harassment of marine mammals in the vicinity of the survey area. The **Federal Register** notice for the proposed IHA (84 FR 69950; December 19, 2019) included a discussion of the effects of anthropogenic noise on marine mammals and their habitat. That information and analysis is incorporated by reference into this final IHA determination and is not repeated here; please refer to that **Federal Register** notice (84 FR 69950; December 19, 2019) for that information. No instances of Level A harassment, serious injury or mortality are expected as a result of the planned activities.

### **Estimated Take**

This section provides an estimate of the number of incidental takes authorized through this IHA, which will inform both NMFS' consideration of "small numbers" and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. 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).

Authorized takes will be by Level B harassment only, in the form of disruption of behavioral patterns for individual marine mammals resulting from exposure to the acoustic stressors. Based on the nature of the acoustic sources planned for this activity (*i.e.*, small Level A harassment zones), Level A harassment is neither anticipated, nor authorized. In addition, the anticipated effectiveness of the mitigation measures (*i.e.*, visual mitigation monitoring; establishment of an exclusion zone; shutdown procedures; ramp-up procedures; and vessel strike avoidance measures), discussed in detail below in the **Mitigation** section, further reduce the likelihood that Level A harassment may occur.

As described previously, no mortality is anticipated or authorized for this activity. Below we describe how the take is estimated.

Generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be harassed or incur some degree of hearing impairment; (2) the area or volume of water that will be ensonified above

these levels in a day; (3) the density or occurrence of marine mammals within these ensounded areas; and, (4) and the number of days of activities. We note that while these basic factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.*, previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the authorized take estimate.

### *Acoustic Thresholds*

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment for non-explosive sources – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle), the environment (*e.g.*, bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.*, 2007, Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1  $\mu$ Pa (rms) for continuous (*e.g.*, vibratory pile-driving, drilling) and

above 160 dB re 1  $\mu$ Pa (rms) for non-explosive impulsive (e.g., seismic airguns) or intermittent (e.g., scientific sonar) sources.

NSF’s planned activity includes the use of impulsive seismic sources and continuous icebreaking, and therefore both 160 dB re 1  $\mu$ Pa (rms) and 120 dB re 1  $\mu$ Pa (rms) are applicable for the related activity, respectively.

Level A harassment for non-explosive sources - NMFS’ *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing* (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). NSF’s planned activity includes impulsive and non-impulsive acoustic sources.

These thresholds are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance>.

**Table 3 -- Thresholds Identifying the Onset of Permanent Threshold Shift**

Hearing Group	PTS Onset Acoustic Thresholds* (Received Level)	
	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	<i>Cell 1</i> $L_{pk,flat}$ : 219 dB $L_{E,LF,24h}$ : 183 dB	<i>Cell 2</i> $L_{E,LF,24h}$ : 199 dB
Mid-Frequency (MF) Cetaceans	<i>Cell 3</i> $L_{pk,flat}$ : 230 dB $L_{E,MF,24h}$ : 185 dB	<i>Cell 4</i> $L_{E,MF,24h}$ : 198 dB
High-Frequency (HF) Cetaceans	<i>Cell 5</i> $L_{pk,flat}$ : 202 dB $L_{E,HF,24h}$ : 155 dB	<i>Cell 6</i> $L_{E,HF,24h}$ : 173 dB

Phocid Pinnipeds (PW) (Underwater)	<i>Cell 7</i> $L_{pk,flat}$ : 218 dB $L_{E,PW,24h}$ : 185 dB	<i>Cell 8</i> $L_{E,PW,24h}$ : 201 dB
Otariid Pinnipeds (OW) (Underwater)	<i>Cell 9</i> $L_{pk,flat}$ : 232 dB $L_{E,OW,24h}$ : 203 dB	<i>Cell 10</i> $L_{E,OW,24h}$ : 219 dB
<p>* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.</p> <p><b>Note:</b> Peak sound pressure (<math>L_{pk}</math>) has a reference value of 1 <math>\mu</math>Pa, and cumulative sound exposure level (<math>L_E</math>) has a reference value of 1<math>\mu</math>Pa<sup>2</sup>s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript “flat” is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (<i>i.e.</i>, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.</p>		

### *Ensonified Area*

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds, which include source levels and transmission loss coefficient.

When the NMFS Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, we developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of potential take by Level A harassment. However, these tools offer the best way to predict appropriate isopleths when more sophisticated modeling methods are not available. NMFS continues to develop ways

to quantitatively refine these tools, and will qualitatively address the output where appropriate. For mobile sources such as seismic surveys and icebreaking, the User Spreadsheet predicts the closest distance at which a stationary animal would not incur PTS if the sound source traveled by the animal in a straight line at a constant speed. Inputs used in the User Spreadsheet, and the resulting isopleths, are reported below in Tables 4, 5, and 6. As noted in Table 1, the two 45/105 in<sup>3</sup> GI guns is the preferred configuration for NSF's survey. However, values from the GI configuration Alternate 2, two 105/105 in<sup>3</sup> (420 in<sup>3</sup> total), have been used as the basis for modeling and all related take calculations due to its larger volume (and greater acoustic output) to present the most conservative modeling effort.

**Table 4 -- SEL<sub>cum</sub> Methodology**

Source Velocity (meters/second)	2.315*
1/Repetition rate^ (seconds)	5**

**Note:** Methodology assumes propagation of 20 log R; Activity duration (time) independent.

^ Time between onset of successive pulses.

\* 4.5 kts

\*\* shot interval assumed to be 5 seconds.

Table 5 presents the estimated Level A harassment zones for each marine mammal hearing group, which are based on L-DEO modeling incorporated into the companion User Spreadsheet (NMFS 2018).

**Table 5-- Predicted Distances to the Level A Threshold for Marine Mammals**

Hearing Group	SEL Cumulative PTS Threshold (dB) <sup>1</sup>	SEL Cumulative PTS Distance (m) <sup>1</sup>	Peak PTS Thresh old (dB) <sub>1</sub>	Peak PTS <sup>2</sup> Distance (m) <sup>1</sup>
Low-frequency cetaceans	183	31.1	219	7.55
Mid-frequency cetaceans	185	0.0	230	1.58
Phocid pinnipeds	185	0.3	218	8.47

<sup>1</sup> Cumulative sound exposure level for PTS ( $SEL_{cum}PTS$ ) or Peak ( $SPL_{flat}$ ) resulting in Level A harassment (*i.e.*, injury). Based on 2018 NMFS Acoustic Technical Guidance (NMFS 2018).  
<sup>2</sup> Per NMFS Acoustic Technical Guidance (NMFS 2018), the larger of the dual criteria results are used for the EZ; GI configuration Alternate 2,  $2 \times 105/105 \text{ in}^3$  ( $420 \text{ in}^3$  total).

Predicted distances to Level A harassment isopleths, which vary based on marine mammal hearing groups, were calculated based on modeling performed by L-DEO using the NUCLEUS software program and the NMFS User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to facilitate the estimation of take numbers.

The predicted distances for Level A harassment are sufficiently small (*see* Table 5), that the likelihood of Level A harassment for any marine mammal is considered discountable. Given these small zones and the likelihood that any animal would demonstrate aversive behavior to the presence of the vessel at such close ranges, it is unrealistic that a mammal would stay within such a small area long enough to incur onset of PTS. Hence, Level A harassment is not expected or authorized for this survey.

L-DEO’s modeling methodology is explained in greater detail in the proposed IHA notice (84 FR 69950; December 19, 2019). Please refer to NSF’s IHA application, Attachment A for the Model Report Estimating the Mitigation Zones for Airgun Arrays that could be used in the Amundsen Sea, NSF survey. The estimated distances to the Level B harassment isopleths for all proposed airgun configurations in each water depth category are shown in Table 6.

**Table 6 -- Level B - Predicted Distances to the Level B Threshold ( $160 \text{ re } 1\mu Pa_{rms}$  isopleths)**

Source and volume ( $\text{cm}^3$ )[ $\text{in}^3$ ]	Tow depth (m)	Water depth (m) <sup>1</sup>	Predicted $160 \text{ re } 1\mu Pa_{rms}$ (m) isopleth <sup>2</sup>
2 x 45/105 $\text{in}^3$ (300 $\text{in}^3$ ) GI guns*	3	100-1000	979
		>1000	653
1 x 45/105 $\text{in}^3$ (150 $\text{in}^3$ )	3	100-1000	503

GI guns <sup>***</sup>			
		>1000	335
2 x 105/105 in <sup>3</sup> (420 in <sup>3</sup> ) GI guns <sup>**</sup>	3	100-1000	1044
		>1000	696
1 x 105/105 in <sup>3</sup> (210 in <sup>3</sup> ) GI guns <sup>***</sup>	3	100-1000	531
		>1000	354

<sup>1</sup> No seismic operations would be conducted in shallow depths (0-100 m).

<sup>2</sup> RMS radii is based on LDEO modeling and empirical measurements. Radii for 100-1000 m depth values = deep water values \* 1.5 correction factor.

\* Preferred configuration.

\*\* Configuration used in all related take calculations to present the maximum possible effect of the survey.

\*\*\* Alternates.

### *Marine Mammal Occurrence*

In this section we provide the information about the presence, density, or group dynamics of marine mammals that informed the take calculations.

For the planned survey area in west Antarctica, NSF and NMFS determined that the preferred sources of density data for marine mammal species that might be encountered in the project area were Ainley *et al.* (2007), Gohl (2010), and Navy Marine Species Density Database (2012). Densities were estimated using sightings and effort during aerial and vessel-based surveys conducted in and adjacent to the proposed project area, as well as from cetacean density models (NMSDD 2012; see NSF IHA application). NMFS finds the available monitoring information from the previous NSF cruise in the Ross Sea (Mehle *et al.* 2015), based on their observations of 14 sightings of 254 killer whales and 2 blue whales, to support group size and be the most conservative. In addition, NMFS included the southern elephant seal to the marine mammals potentially present in the project area (Hofmeyr 2015), and divided the available minke whale data, which is undifferentiated, into the two species that may be affected; Antarctic and Common (dwarf) minke whales.

Since Mehle *et al.* (2015) reported monitoring information rather than specific densities, and both the Ainley *et al.* (2007) and Mehle *et al.* (2015) monitoring efforts were conducted from the same vessel, the *Palmer*, in Antarctica, NMFS derived density values from Mehle *et al.* (2015) using the same calculation method as was used by NSF to calculate density from the Ainley *et al.* (2007) data. Specifically, we used the 1.6 km visual transect width and 556 km survey distance to produce 889.6 km<sup>2</sup> area surveyed, allowing the number of individuals sighted to be divided by the area to obtain a density value for each relevant species.

All data sources used for animal abundance are listed in Table 2 above. Estimated densities used to inform take estimates are presented in Table 7.

**Table 7 -- Marine Mammal Densities in the Proposed Survey Area**

Species	Areal Density (#/ km <sup>2</sup> )	Data Source
<b><i>Low-frequency cetaceans</i></b>		
Blue whale	0.00005	NMSDD 2012
Fin whale	0.00722	NMSDD 2012
Humpback whale	0.00014	Gohl 2010
Minke whale	1.14996	Mehle <i>et al.</i> 2015
Antarctic minke whale	0.57498	
Common (dwarf) minke whale	0.57498	
Sei whale	0.00026	NMSDD 2012
<b><i>Mid-frequency cetaceans</i></b>		
Arnoux's beaked whale	0.00624	NMSDD 2012
Killer whale	0.28552	NMSDD 2012
Layard's beaked whale	0.00064	Mehle <i>et al.</i> 2015
Long-finned pilot whale	0.00786	NMSDD 2012
Southern bottlenose whale	0.00676	NMSDD 2012
Sperm whale	0.01699	NMSDD 2012

Gray's beaked whale	0.00028	Ainley <i>et al.</i> , 2007
<b><i>Phocids</i></b>		
Crabeater seal	0.00762	Gohl 2010
Leopard seal	0.00005	Gohl 2010
Ross seal	0.00001	Gohl 2010
Southern Elephant Seal	1.03175	Hindell <i>et al.</i> , 2016
Weddell seal	0.00013	Gohl 2010
<b>Notes:</b> -Where the area surveyed was not indicated in the reference document, a value of 315,000 km <sup>2</sup> was used, estimate of the area of the Amundsen Sea Continental shelf (Jacobs 2012) - NMSDD-Maximum density values during the austral summer for the Amundsen Sea (between 100°W-105°W and south of 70°S).		

### *Take Calculation and Estimation*

Here we describe how the information provided above is brought together to produce a quantitative take estimate.

#### Seismic Surveys

In order to estimate the number of marine mammals predicted to be exposed to sound levels that would result in Level B harassment, radial distances from the airgun array to predicted isopleths corresponding to the Level B harassment thresholds are calculated, as described in the notice of proposed IHA. Those radial distances are then used to calculate the area(s) around the airgun array predicted to be ensonified to sound levels that exceed the Level B harassment thresholds. The area estimated to be ensonified in a single day of the survey is then calculated (Table 8), based on the areas predicted to be ensonified around the array and the estimated trackline distance traveled per day. This number is then multiplied by the number of survey days. The product is then multiplied by 1.25 to account for the additional 25 percent contingency. This results in an estimate of the total area (km<sup>2</sup>) expected to be ensonified to the Level B harassment thresholds for each acoustic source (Table 8).

**Table 8 -- Areas (km<sup>2</sup>) to be Ensonified to Level B Harassment Thresholds**

Criteria	Distance/Day (km)	Daily Ensonified Area w/ Endcaps (km <sup>2</sup> )	# days of survey	Plus 25% Buffer (days)	Total Ensonified Area
<b>LEVEL B Area (160 dB)</b>					
<b>65% = 100-1000 m</b>	130	274.86	8.00	10.00	2748.62
<b>35% = &gt;1000 m</b>	70	98.96	8.00	10.00	989.61
			<b>ALL DEPTHS</b>		<b>3738.23</b>
<b>Icebreaking (120 dB)</b>					
	223	3003.8	2.00	2.50	7509.49

The marine mammals predicted to occur within these respective areas, based on estimated densities (Table 7), are assumed to be incidentally taken. As discussed previously, based on the small anticipated Level A harassment isopleths and in consideration of the mitigation measures (see **Mitigation** section below), take by Level A harassment is not expected to occur and is not authorized. Estimated exposures for the planned survey are shown in Table 9.

Icebreaking

The USCGC *Healy* served as a proxy for the source levels expected to result from icebreaking by the *Palmer* to calculate the ensonified area (Table 8) and Level B take (Table 9): 196.2 db at 1 m source level (Roth 2013), transmission loss  $20\log R$ , assuming spherical spreading, and resulting 6.456 km radius to the 120 dB harassment threshold. The maximum estimated amount of icebreaking expected by NSF; *i.e.* 445 km for the maximum of 48 hours, was used in these calculations to avoid the significant overestimation of assuming icebreaking will occur every day (8 survey days, plus 2 contingency days). We calculate the ensonified area associated with icebreaking using the maximum duration of 48 hours icebreaking rather than the

10 days of the potential survey, as it is unlikely that any given animal would experience the stressor continuously for 10 days.

It should be noted that the authorized take numbers shown in Table 9 are expected to be conservative because in the calculations of estimated take, 25 percent has been added in the form of operational survey days. This is to account for the possibility of additional seismic operations associated with airgun testing and repeat coverage of any areas where initial data quality is sub-standard.

Following our development of the aforementioned take estimates, and based on our review of recommendations from the Marine Mammal Commission (described previously in “Comments and Responses”) we increased Level B harassment take estimates for the following species as stated here: 40 humpback whales, 2,000 crabeater seals, 100 Weddell seals, 50 leopard seals, and 10 Ross seals based on group size and documented occurrence in the Amundsen Sea (Gohl 2010).

**Table 9 -- Calculated and Authorized Level B Exposures, and Percentage of Stock Exposed**

Species	Calculated Level B Take Seismic	Calculated Level B Take Icebreaking	Authorized Total Take	Percent of Population
<i>Low-frequency cetaceans</i>				
Blue whale	1	1	2	0%
Fin whale	27	54	81	0.2%
Humpback whale	1	1	40 <sup>b</sup>	0.1%
Antarctic minke whale	2149	4318	6467	2.5%
Common (dwarf) minke whale	2149	4318	6467	2.5%
Sei whale	1	2	6 <sup>a</sup>	0%

<b><i>Mid-frequency cetaceans</i></b>				
Arnoux's beaked whale	23	47	70	0%
Killer whale	1067	2144	3211	12.8%
Layard's beaked whale	2	5	7	0%
Long-finned pilot whale	29	59	88	0%
Southern bottlenose whale	25	51	76	0%
Sperm whale	63	128	191	1.6%
Gray's beaked whale	1	2	3	0%
<b><i>Phocids</i></b>				
Crabeater seal	28	57	2000 <sup>c</sup>	0.1%
Leopard seal	0	0	50 <sup>c</sup>	0%
Ross seal	0	0	10 <sup>c</sup>	0%
Southern elephant Seal	8897	7748	16645	6.7%
Weddell seal	0	1	100 <sup>c</sup>	0%
<p>a. Authorized take increased to group size from Würsig <i>et al.</i> (2018).</p> <p>b. Changed based on recommendation from the MMC based on a group of four whales being taken on each of the 10 days. Gohl (2010) did not specify the group size of humpback whales observed in the Amundsen Sea, but Thiele <i>et al.</i> (2004) documented group size of up to four humpback whales in a given group off the western Antarctic Peninsula.</p> <p>c. Changed based on recommendation from the MMC, the numbers of pinniped takes were based on the relative occurrence of the various species based on Gohl (2010). 200 crabeater seals, 10 Weddell seals, 5 leopard seals, and 1 Ross seal could be taken on each of the 10 days of activities.</p>				

## **Mitigation Measures**

In order to issue an IHA under Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability

and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

(1) the manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result as planned), the likelihood of effective implementation (probability implemented as planned), and;

(2) the practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

#### *Mitigation for Marine Mammals and their Habitat*

NSF has reviewed mitigation measures employed during seismic research surveys authorized by NMFS under previous incidental harassment authorizations, as well as recommended best practices in Richardson *et al.* (1995), Pierson *et al.* (1998), Weir and Dolman (2007), Nowacek *et al.* (2013), Wright (2014), and Wright and Cosentino (2015), and has incorporated a suite of required mitigation measures into their project description based on the above sources.

To reduce the potential for disturbance from acoustic stimuli associated with the activities, NSF is required to implement mitigation measures for marine mammals. Mitigation measures that must be adopted during the planned surveys include (1) Vessel-based visual mitigation monitoring; (2) Establishment of a marine mammal Exclusion Zone (EZ) and buffer zone; (3) shutdown procedures; (4) ramp-up procedures; and (4) vessel strike avoidance measures.

#### *Vessel-Based Visual Mitigation Monitoring*

Visual monitoring requires the use of trained observers (herein referred to as visual Protected Species Observers (PSOs)) to scan the ocean surface visually for the presence of marine mammals. PSO(s) must be on duty and conducting visual observations at all times during daylight hours (*i.e.*, from 30 minutes prior to sunrise through 30 minutes following sunset). Following a shutdown for any reason, observations must occur for at least 30 minutes prior to the planned start of airgun operations. Observations must also occur for 60 minutes after airgun operations cease for any reason (or until 30 minutes following sunset). Observations must also be made during daytime periods when the *Palmer* is underway without seismic operations, such as during transits, to allow for comparison of sighting rates and behavior with and without airgun operations and between acquisition periods. Airgun operations must be suspended when marine mammals are observed within, or about to enter, the designated EZ (as described below).

During seismic operations, three visual PSOs must be based aboard the *Palmer*. PSOs must be appointed by NSF with NMFS approval. One dedicated PSO must monitor the EZ during all daytime seismic operations. PSO(s) must be on duty in shifts of duration no longer than four hours. Other vessel crew must also be instructed to assist in detecting marine mammals and in implementing mitigation requirements (if practical). Before the start of the

seismic survey, the crew must be given additional instruction in detecting marine mammals and implementing mitigation requirements.

The *Palmer* is a suitable platform from which PSOs will watch for marine mammals. Standard equipment for marine mammal observers must be 7 x 50 reticule binoculars and optical range finders. At night, night-vision equipment must be available. The observers must be in communication with ship's officers on the bridge and scientists in the vessel's operations laboratory, so they can advise promptly of the need for avoidance maneuvers or seismic source shutdown.

The PSOs must have no tasks other than to conduct observational effort, record observational data, and communicate with and instruct relevant vessel crew with regard to the presence of marine mammals and mitigation requirements. PSO resumes must be provided to NMFS for approval. At least one PSO must have a minimum of 90 days at-sea experience working as a PSO during a seismic survey. One "experienced" visual PSO must be designated as the lead for the entire protected species observation team. The lead will serve as primary point of contact for the vessel operator.

#### *Exclusion Zone and Buffer Zone*

An EZ is a defined area within which occurrence of a marine mammal triggers mitigation action intended to reduce the potential for certain outcomes, *e.g.*, auditory injury, severe behavioral reaction. The PSOs must establish a minimum EZ with a 100 m radius for the airgun array. The EZs must be based on radial distance from any element of the airgun array (rather than being based on the center of the array or around the vessel itself). With certain exceptions (described below), if a marine mammal appears within or enters this zone, the acoustic source must be shut down (see Shutdown Procedures below).

The 100-m radial distance of the standard EZ is precautionary in the sense that it is expected to contain sound exceeding injury criteria for all marine mammal hearing groups (Table 3) while also providing a consistent, reasonably observable zone within which PSOs will typically be able to conduct effective observational effort. In this case, the 100-m radial distance is also expected to contain sound that will exceed the Level A harassment threshold based on sound exposure level ( $SEL_{cum}$ ) criteria for all marine mammal hearing groups (Table 3).

Our intent in prescribing a standard EZ distance is to (1) encompass zones within which auditory injury could occur on the basis of instantaneous exposure; (2) provide additional protection from the potential for more severe behavioral reactions (*e.g.*, panic, antipredator response) for marine mammals at relatively close range to the acoustic source; (3) provide consistency for PSOs, who need to monitor and implement the EZ; and (4) define a distance within which detection probabilities are reasonably high for most species under typical conditions.

PSOs will also establish and monitor an additional buffer to the exclusion zone, *i.e.*, must monitor the 100-m exclusion zone plus an additional 100-m buffer for a total of 200 m. During use of the acoustic source, occurrence of marine mammals within the buffer zone (but outside the EZ) will be communicated to the operator to prepare for potential shutdown of the acoustic source. In context of the larger extended EZ (discussed in the following paragraph), the buffer zone is largely applicable to the pre-clearance period prior to beginning the ramp-up procedure (as discussed further under *Ramp-up Procedures*, later in this section).

An extended EZ of 500 m must be enforced for all beaked whales and for Southern right whales. The latter is a precautionary measure as right whales are not expected in the survey area. NSF will also implement a 500-m EZ for aggregations of six or more large whales (*i.e.*, sperm

whale or any baleen whale) or a large whale with a calf (calf defined as an animal less than two-thirds the body size of an adult observed to be in close association with an adult).

### *Shutdown Procedures*

If a marine mammal appears within or enters the relevant EZ, the airguns must be shut down. Following a shutdown, airgun activity must not resume until the marine mammal has cleared the relevant EZ. The animal is considered to have cleared the EZ if the following conditions have been met:

- it is visually observed to have departed the EZ;
- it has not been seen within the EZ for 15 minutes in the case of small odontocetes and pinnipeds; or
- it has not been seen within the EZ for 30 minutes in the case of mysticetes and large odontocetes, including sperm and beaked whales.

Shutdown of the acoustic source is required upon observation of a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized number of takes are met, observed entering or within the Level B harassment zone.

### *Ramp-up Procedures*

Ramp-up of an acoustic source is intended to provide a gradual increase in sound levels following a shutdown, enabling animals to move away from the source if the signal is sufficiently aversive prior to its reaching full intensity. Ramp-up is required after the array is shut down for any reason for longer than 15 minutes. Ramp-up must begin with the activation of the smallest airgun in the array, with subsequent airgun(s) activated after 5 minute intervals.

Two PSOs are required to monitor during ramp-up. During ramp up, the PSOs must monitor the EZ, and if marine mammals were observed within the EZ, a shutdown will be

implemented as though the full array were operational. If airguns have been shut down due to PSO detection of a marine mammal within or approaching the EZ, ramp-up must not be initiated until all marine mammals have cleared the EZ, during the day or night. Criteria for clearing the EZ is described above.

Thirty minutes of pre-clearance observation are required prior to ramp-up for any shutdown of longer than 30 minutes (*e.g.*, when the array is shut down during transit from one line to another). This 30-minute pre-clearance period may occur during any vessel activity (*i.e.*, transit). If a marine mammal were observed within or approaching the relevant EZ during this pre-clearance period, ramp-up must not be initiated until all marine mammals cleared the EZ. Criteria for clearing the EZ must be as described above. If the airgun array has been shut down for reasons other than mitigation (*e.g.*, mechanical difficulty) for a period of less than 30 minutes, it may be activated again without ramp-up if PSOs have maintained constant visual observation and no detections of any marine mammal have occurred within the EZ or buffer zone. Ramp-up must be planned to occur during periods of good visibility when possible. However, ramp-up will be allowed at night and during poor visibility if the 100 m EZ and buffer zone have been monitored by visual PSOs for 30 minutes prior to ramp-up.

The operator is required to notify a designated PSO of the planned start of ramp-up as agreed-upon with the lead PSO; the notification time should not be less than 60 minutes prior to the planned ramp-up. A designated PSO must be notified again immediately prior to initiating ramp-up procedures and the operator must receive confirmation from the PSO to proceed. The operator must provide information to PSOs documenting that appropriate procedures were followed. Following deactivation of the array for reasons other than mitigation, the operator is

required to communicate the near-term operational plan to the lead PSO with justification for any planned nighttime ramp-up.

#### *Vessel Strike Avoidance Measures*

Vessel strike avoidance measures are intended to minimize the potential for collisions with marine mammals. These requirements do not apply in any case where compliance will create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of the restriction, cannot comply.

The required measures include the following: Vessel operator and crew must maintain a vigilant watch for all marine mammals and slow down or stop the vessel or alter course to avoid striking any marine mammal. A visual observer aboard the vessel must monitor a vessel strike avoidance zone around the vessel according to the parameters stated below. Visual observers monitoring the vessel strike avoidance zone must be either third-party observers or crew members, but crew members responsible for these duties must be provided sufficient training to distinguish marine mammals from other phenomena. Vessel strike avoidance measures must be followed during surveys and while in transit.

The vessel must maintain a minimum separation distance of 100 m from large whales (*i.e.*, baleen whales and sperm whales). If a large whale is within 100 m of the vessel, the vessel must reduce speed and shift the engine to neutral, and must not engage the engines until the whale has moved outside of the vessel's path and the minimum separation distance has been established. If the vessel is stationary, the vessel must not engage engines until the whale(s) has moved out of the vessel's path and beyond 100 m. The vessel must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 m from all other marine mammals. If an animal is encountered during transit, the vessel must attempt to remain parallel

to the animal's course, avoiding excessive speed or abrupt changes in course. Vessel speeds must be reduced to 10 kts or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near the vessel.

Based on our evaluation of the applicant's required measures, as well as other measures considered by NMFS, NMFS has determined that the required mitigation measures provide the means effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

### **Monitoring and Reporting**

In order to issue an IHA 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 are expected to be present in the planned action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density).
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of:  
(1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected

species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas).

- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors.
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks.
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat).
- Mitigation and monitoring effectiveness.

NSF described a marine mammal monitoring and reporting plan within their IHA application. Monitoring that is designed specifically to facilitate mitigation measures, such as monitoring of the EZ to inform potential shutdowns of the airgun array, are described above and are not repeated here. NSF's monitoring and reporting plan includes the following measures:

#### *Vessel-Based Visual Monitoring*

As described above, PSO observations must take place during daytime airgun operations and nighttime start-ups (if applicable) of the airguns. During seismic operations, three visual PSOs must be based aboard the *Palmer*. PSOs must be appointed by NSF with NMFS approval. The PSOs must have successfully completed relevant training, including completion of all required coursework and passing a written and/or oral examination developed for the training program, and must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences and a minimum of 30 semester hours or equivalent in the biological sciences and at least one undergraduate course in math or statistics.

The educational requirements may be waived if the PSO has acquired the relevant skills through alternate training, including (1) secondary education and/or experience comparable to PSO duties; (2) previous work experience conducting academic, commercial, or government-sponsored marine mammal surveys; or (3) previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties.

During seismic operations, one PSO is required to monitor for marine mammals around the vessel. PSOs must be on duty in shifts of duration no longer than four hours. Other crew must also be instructed to assist in detecting marine mammals and in implementing mitigation requirements (if practical). During daytime, PSOs must scan the area around the vessel systematically with reticle binoculars (*e.g.*, 7×50 Fujinon) and with the naked eye. At night, PSOs must be equipped with night-vision equipment.

PSOs must record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. Data must be used to estimate numbers of animals potentially ‘taken’ by harassment (as defined in the MMPA). They must also provide information needed to order a shutdown of the airguns when a marine mammal is within or near the EZ. When a sighting is made, the following information about the sighting must be recorded:

- 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; and

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

All observations and shutdowns must be recorded in a standardized format. Data must be entered into an electronic database. The accuracy of the data entry must be verified by computerized data validity checks as the data are entered and by subsequent manual checking of the database. These procedures allow initial summaries of data to be prepared during and shortly after the field program and facilitate transfer of the data to statistical, graphical, and other programs for further processing and archiving. The time, location, heading, speed, activity of the vessel, sea state, visibility, and sun glare must also be recorded 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.

Results from the vessel-based observations must provide:

- 1) The basis for real-time mitigation (*e.g.*, airgun shutdown);
- 2) Information needed to estimate the number of marine mammals potentially taken by harassment, which must be reported to NMFS;
- 3) Data on the occurrence, distribution, and activities of marine mammals in the area where the seismic study is conducted;
- 4) Information to compare the distance and distribution of marine mammals relative to the source vessel at times with and without seismic activity; and
- 5) Data on the behavior and movement patterns of marine mammals seen at times with and without seismic activity.

### *Reporting*

A draft report must be submitted to NMFS within 90 days after the end of the survey. The report must describe the operations that were conducted and sightings of marine mammals near the operations. The report must provide full documentation of methods, results, and

interpretation pertaining to all monitoring and will summarize the dates and locations of seismic operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities). The report must also include estimates of the number and nature of exposures that occurred above the harassment threshold based on PSO observations, including an estimate of those that were not detected in consideration of both the characteristics and behaviors of the species of marine mammals that affect detectability, as well as the environmental factors that affect detectability.

The draft report must also include geo-referenced time-stamped vessel tracklines for all time periods during which airguns were operating. Tracklines must include points recording any change in airgun status (*e.g.*, when the airguns began operating, when they were turned off, or when they changed from full array to single gun or vice versa). GIS files must be provided in ESRI shapefile format and include the UTC date and time, latitude in decimal degrees, and longitude in decimal degrees. All coordinates must be referenced to the WGS84 geographic coordinate system. In addition to the report, all raw observational data must be made available to NMFS. A final report must be submitted within 30 days following the resolution of any comments on the draft report.

### **Negligible Impact Analysis and Determination**

NMFS has defined negligible impact 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 (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). 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 harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS’s implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, our analysis applies to all the species listed in Table 1, given that NMFS expects the anticipated effects of the proposed seismic survey 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.

NMFS does not anticipate that Level A harassment, serious injury or mortality will occur as a result of NSF’s proposed seismic survey, even in the absence of proposed mitigation. Thus, the proposed authorization does not authorize any such takes. As discussed in the *Potential Effects of Specified Activities on Marine Mammals and their Habitat* section in our notice of proposed IHA (84 FR 69950), non-auditory physical effects, stranding, and vessel strike are not expected to occur.

No takes by Level A harassment are expected or authorized. As described above, we expect that marine mammals will be likely to move away from a sound source that represents an aversive stimulus, especially at levels that will be expected to result in PTS, given sufficient notice of the *Palmer's* approach due to the vessel's relatively low speed when conducting seismic surveys. The 100-m exclusion zone encompasses the Level A harassment isopleths for all marine mammal hearing groups, and is expected to prevent animals from being exposed to sound levels that will cause PTS. We expect that any instances of take will be in the form of short-term Level B behavioral harassment in the form of temporary avoidance of the area or decreased foraging (if such activity were occurring), reactions that are considered to be of low severity and with no lasting biological consequences (*e.g.*, Southall *et al.*, 2007).

Marine mammal habitat may be impacted by elevated sound levels, but these impacts will be temporary. Feeding behavior is not likely to be significantly impacted, as marine mammals appear to be less likely to exhibit behavioral reactions or avoidance responses while engaged in feeding activities (Richardson *et al.*, 1995). Prey species are mobile and are broadly distributed throughout the project area; therefore, marine mammals that may be temporarily displaced during survey activities are expected to be able to resume foraging once they have moved away from areas with disturbing levels of underwater noise. Because of the temporary nature of the disturbance, the availability of similar habitat and resources in the surrounding area, and the lack of important or unique marine mammal habitat, the impacts to marine mammals and the food sources that they utilize are not expected to cause significant or long-term consequences for individual marine mammals or their populations. In addition, there are no feeding, mating or calving areas known to be biologically important to marine mammals within the proposed project area.

The activity is expected to impact a very small percentage of all marine mammal populations that will be affected by NSF's planned survey (less than 13 percent each for all marine mammal populations combined). Additionally, the acoustic "footprint" of the planned survey will be very small relative to the ranges of all marine mammal species that will potentially be affected. Sound levels will increase in the marine environment in a relatively small area surrounding the vessel compared to the range of the marine mammals within the planned survey area. This includes the small amount of icebreaking, hours at most, expected. The effects of icebreaking are transitory, localized, and constrained to a relatively narrow swath to each side of the vessel. The seismic array will be active 24 hours per day throughout the duration of the proposed survey. However, the very brief overall duration of the planned survey (eight days) will further limit potential impacts that may occur as a result of the proposed activity.

The planned mitigation measures are expected to reduce the number and/or severity of takes by allowing for detection of marine mammals in the vicinity of the vessel by visual observers, and by minimizing the severity of any potential exposures via shutdowns of the airgun array. Based on previous monitoring reports for substantially similar activities that have been previously authorized by NMFS, we expect that the required mitigation will be effective in minimizing impacts.

Of the marine mammal species under our jurisdiction that are likely to occur in the project area, the following species are listed as endangered under the ESA: blue, fin, sei, and sperm whales. Given the very low numbers of takes for these species (Table 9), relative to their population sizes, as well as the type of take (Level B harassment) we do not expect population-level impacts to any of these species. The other marine mammal species that may be taken by

harassment during NSF's seismic survey and icebreaking activities are not listed as threatened or endangered under the ESA. There is no designated critical habitat for any ESA-listed marine mammals within the project area; of the non-listed marine mammals for which we authorize take, none are considered "depleted" by NMFS under the MMPA.

NMFS concludes that exposures to marine mammal species due to NSF's planned seismic survey will result in only short-term (temporary and short in duration) effects to individuals exposed, or some small degree of PTS to a very small number of individuals. Marine mammals may temporarily avoid the immediate area, but are not expected to permanently abandon the area. Major shifts in habitat use, distribution, or foraging success are not expected. NMFS does not anticipate the authorized take estimates to impact annual rates of recruitment or survival.

In summary and as described above, the following factors primarily support our determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No mortality or serious injury is anticipated or authorized;
- No take by Level A harassment is anticipated or authorized;
- The anticipated impacts of the proposed activity on marine mammals will primarily be temporary behavioral changes of small percentages of the affected species due to avoidance of the area around the survey vessel. The relatively short duration of the proposed survey (10 days; eight days of survey plus two contingency days) will further limit the potential impacts of any temporary behavioral changes that will occur;

- The availability of alternate areas of similar habitat value for marine mammals to temporarily vacate the survey area during the proposed survey to avoid exposure to sounds from the activity;
- The proposed project area does not contain areas of significance for feeding, mating or calving;
- The potential adverse effects on fish or invertebrate species that serve as prey species for marine mammals from the proposed survey will be temporary and spatially limited; and
- The planned mitigation measures, including visual and acoustic monitoring and shutdowns, are expected to minimize potential impacts to marine mammals.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the required monitoring and mitigation measures, NMFS finds that the total marine mammal take from the proposed activity will have a negligible impact on all affected marine mammal species or stocks.

### **Small Numbers**

As noted above, only small numbers of incidental take may be authorized under Sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

Marine mammals in the survey area are not assigned to NMFS stocks. For purposes of the small numbers analysis, we rely on the best available information on the abundance estimates for the species of marine mammals that could be taken. The numbers of marine mammals that we authorize to be taken will be considered small relative to the relevant populations (less than 13 percent for all species).

Based on the analysis contained herein of the planned activity (including the required mitigation and monitoring measures) and the authorized take of marine mammals, NMFS concludes that small numbers of marine mammals will be taken relative to the population sizes of the affected species or stocks.

#### **Unmitigable Adverse Impact Analysis and Determination**

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks will not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

#### **National Environmental Policy Act**

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed action (*i.e.*, the issuance of an incidental harassment authorization) with respect to potential impacts on the human environment.

This action is consistent with categories of activities identified in Categorical Exclusion B4 (incidental harassment authorizations with no anticipated serious injury or mortality) of the Companion Manual for NOAA Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment

and for which we have not identified any extraordinary circumstances that will preclude this categorical exclusion. Accordingly, NMFS has determined that the issuance of the IHA qualifies to be categorically excluded from further NEPA review.

### **Endangered Species Act (ESA)**

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq.*) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally, in this case with the ESA Interagency Cooperation Division, whenever we propose to authorize take for endangered or threatened species.

The NMFS Office of Protected Resources Interagency Cooperation Division issued a Biological Opinion on January 23, 2020, under section 7 of the ESA, on the issuance of an IHA to NSF under section 101(a)(5)(D) of the MMPA by the NMFS Office of Protected Resources Permits and Conservation Division. The Biological Opinion concluded that the proposed action is not likely to jeopardize the continued existence of blue, fin, sei, and sperm whales, and is not likely to destroy or modify critical habitat of listed species because no critical habitat exists for these species in the action area.

### **Authorization**

As a result of these determinations, NMFS has issued an IHA to NSF for conducting the specified activity in the Amundsen Sea, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Dated: January 27, 2019.

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Donna S. Wieting,

Director, Office of Protected Resources,

National Marine Fisheries Service.

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