PROPOSED ACTION:	Issuance of an Incidental Harassment Authorization to Scripps Institution of Oceanography to Take Marine Mammals by Harassment Incidental to a Low-Energy Marine Geophysical Survey in the Tropical Western Pacific Ocean, September to October 2013.
TYPE OF STATEMENT:	Environmental Assessment
LEAD AGENCY:	U.S. Department of Commerce, National Oceanic and Atmospheric Administration National Marine Fisheries Service
RESPONSIBLE OFFICIAL:	Donna S. Wieting, Director, Office of Protected Resources, National Marine Fisheries Service
FOR FURTHER INFORMATION:	Howard Goldstein National Marine Fisheries Service Office of Protected Resources, Permits and Conservation Division 1315 East West Highway Silver Spring, MD 20910 301-427-8401
LOCATION:	Tropical Western Pacific Ocean in International Waters and within the Exclusive Economic Zones of the Federated States of Micronesia, the Independent State of Papua New Guinea, the Republic of Indonesia, and the Republic of the Philippines (Approximately 4 º South to 8º North and 126.5 to 144.5º East)
ABSTRACT:	This Environmental Assessment analyzes the environmental impacts of the National Marine Fisheries Service, Office of Protected Resources, Permits and Conservation Division's proposal to issue an Incidental Harassment Authorization to Scripps Institution of Oceanography for the taking, by Level B harassment, of small numbers of marine mammals, incidental to conducting a low-energy marine geophysical survey in the Tropical Western Pacific Ocean, September to October 2013.

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LIST OF ABBREVIATIONS OR ACRONYMS

AEP	auditory evoked potential
BiOp	Biological Opinion
CFR	Code of Federal Regulations
Commission	Marine Mammal Commission
dB	decibel
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.)
FONSI	Finding of No Significant Impact
FR	*Federal Register*
ft	feet
IHA	Incidental Harassment Authorization
ITA	Incidental Take Authorization
ITS	Incidental Take Statement
km	kilometer
km/hr	kilometer per hour
kts	knots
m	meter
mi	mile
mph	miles per hour
MMPA	Mammal Protection Act of 1972, as amended (16 U.S.C. 1631 *et seq*.)
µPa	microPascal
PSO	Protected Species Observer
Revelle	R/V *Roger Revelle*
SIO	Scripps Institution of Oceanography

EXECUTIVE SUMMARY

The National Marine Fisheries Service (NMFS), Office of Protected Resources, Permits and Conservation Division has prepared this Environmental Assessment (EA) pursuant to the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. §§ 4321 *et seq*.), the Council on Environmental Quality (CEQ) regulations in 40 CFR §§ 1500-1508, and NOAA Administrative Order 216-6.

ES.1 Description of the Proposed Action

We (National Marine Fisheries Service, Office of Protected Resources, Permits and Conservation Division) propose to issue an Incidental Harassment Authorization (IHA) to Scripps Institution of Oceanography (SIO), a part of the University of California at San Diego, under the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. §§ 1631 *et seq*.) for the incidental taking of small numbers of marine mammals, incidental to the conduct of a low-energy marine geophysical (seismic) survey on the high seas (i.e., international waters) and within the Exclusive Economic Zones (EEZ) of the Federated States of Micronesia (Micronesia), the Independent State of Papua New Guinea (Papua New Guinea), the Republic of Indonesia (Indonesia), and the Republic of the Philippines (Philippines) in the tropical western Pacific Ocean, September through October 2013. We do not have the authority to permit, authorize, or prohibit SIO's low-energy seismic survey in the tropical western Pacific Ocean.

Our proposed action is a direct outcome of SIO requesting an authorization to take marine mammals, by harassment, incidental to conducting a low-energy marine seismic survey in the tropical western Pacific Ocean. SIO's low-energy seismic survey activities, which have the potential to cause marine mammals to be behaviorally disturbed, warrant an incidental take authorization from us under section 101(a)(5)(D) of the MMPA.

ES.2 Scope of this Environmental Assessment

This EA titled, *Environmental Assessment on the Issuance of an Incidental Harassment Authorization to the Scripps Institution of Oceanography to Take Marine Mammals by Harassment Incidental to a Low-Energy Marine Geophysical Survey in the Tropical Western Pacific Ocean, September to October 2013*, focuses primarily on the environmental effects of authorizing the take of marine mammals incidental to SIO's activities.

To evaluate the effects of conducting the low-energy marine geophysical (seismic) survey in the tropical western Pacific Ocean during a period between September and October 2013, the National Science Foundation (NSF) has prepared an *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013* (LGL, 2013) (available at: http://www.nmfs.noaa.gov/pr/pdfs/permits/scripps_westernpacific_ea2013_draft.pdf). We do not duplicate their analysis; rather we incorporate it by reference as explained further in this document. NSF's 2013 analysis tiers to the 2011 *Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF/USGS PEIS) (NSF, 2011) (available at: http://www.nsf.gov/geo/oce/envcomp/usgs-nsf-marine-seismic-research/nsf-usgs-final-eis-oeis_3june2011.pdf) which considers all impacts of conducting a low-energy seismic survey. We incorporate the 2011 NMFS/USGS PEIS by reference. Last, we published a notice for the proposed

IHA in the *Federal Register* (78 FR 33811, June 5, 2013; [NMFS, 2013]) (available at: http://www.gpo.gov/fdsys/pkg/FR-2013-06-05/pdf/2013-13289.pdf) which provided a detailed description of the proposed low-energy seismic survey and environmental information and issues related to it. We also incorporate that notice by reference.

We have prepared this EA to assist in determining whether the direct, indirect, and cumulative impacts related to our issuance of an IHA under the MMPA for marine mammals for SIO's survey is likely to result in significant impacts to the human or natural environment. This EA is intended to inform our decision on issuing the IHA. While the focus of this EA is on the effects caused by the proposed issuance of an IHA, in combining this analysis with the analyses in the previously referenced documents, we have considered all impacts associated with the underlying action which is the full suite of activities conducted for their proposed low-energy seismic survey. We anticipate the issuance of an IHA to take small numbers of marine mammals incidental to SIO's specified activities in a specific geographic region to affect marine mammals and their habitat.

Our NEPA analysis further evaluates effects to marine mammals and their habitat due to the specific scope of the decision for which we are responsible (i.e., whether or not to issue the IHA which includes prescribed means of incidental take, mitigation measures, and monitoring requirements). Our review of public comments submitted in response to our notice for the proposed IHA in the *Federal Register* (78 FR 33811, June 5, 2013) did not reveal additional environmental impacts or issues requiring analysis in this EA.

ES.3 Alternatives

Our Proposed Action (Preferred Alternative) represents the Authorization of take incidental to the applicant's seismic survey, along with required monitoring and mitigation measures for marine mammals that would minimize potential adverse environmental impacts. The Authorization includes prescribed means of incidental take, mitigation and monitoring measures, and reporting requirements.

For the No Action Alternative, we would not issue an IHA to SIO for the taking, by Level B harassment, of small numbers of marine mammals, incidental to the low-energy seismic survey.

- The No Action Alternative also includes the full suite of activities conducted by SIO for the low-energy seismic survey. Because we do not have the authority to permit, authorize, or prohibit the seismic surveys themselves, SIO may decide to: (1) continue with the seismic survey with the inclusion of mitigation and monitoring measures sufficient to preclude any incidental take of marine mammals; (2) continue the seismic survey and be in violation of the MMPA if take of marine mammals occurs; or (3) choose not to conduct the seismic survey.
- For purposes of this NEPA analysis, however, we characterize no action as the applicant's implementation of the proposed seismic survey without the mitigation and monitoring measures for marine mammals prescribed in the IHA for incidental take in order to sharply compare and contrast alternatives.

ES.4 Environmental Impacts of the Proposed Action

SIO's proposed low-energy seismic survey activities would involve active acoustics that have the potential to cause marine mammals to be behaviorally disturbed.

- The impacts of conducting the seismic survey on marine mammals are specifically related to acoustic activities, and these are expected to be temporary in nature, negligible, and would not result in substantial impacts to marine mammals or to their role in the ecosystem.
- Thus, the action alternative includes a suite of mitigation measures intended to minimize potentially adverse interactions with marine mammals and their habitat. We acknowledge that the incidental take authorized by the IHA would potentially result in insignificant, unavoidable adverse impacts. However, we believe that the issuance of an IHA would not result in significant cumulative effects on marine mammal species or their habitats.

The analysis in this EA, including the documents we incorporate by reference, serve as the basis for determining whether our issuance of an IHA to SIO for the taking, by Level B harassment, of small numbers of marine mammals, incidental to the conduct of the low-energy marine seismic survey in the tropical western Pacific Ocean, September to October 2013 would result in significant impacts to the human environment.

CHAPTER 1 – INTRODUCTION AND PURPOSE AND NEED

1.1 DESCRIPTION OF PROPOSED ACTION

The Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1631 *et seq*.) prohibits the incidental taking of marine mammals. For a marine mammal to be incidentally taken, it is either killed, seriously injured, or harassed. The MMPA defines harassment as any act of pursuit, torment, or annoyance which: (1) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (2) 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). There are exceptions to the MMPA's prohibition on take such as the authority at issue here for us to authorize the incidental taking of small numbers of marine mammals by harassment upon the request of a U.S. citizen provided certain statutory and regulatory procedures are met and determinations made. We describe this exception set forth in the MMPA at section 101(a)(5)(D) in more detail in Section 1.2.

We (NMFS, Office of Protected Resources, Permits and Conservation Division) propose to issue an IHA to SIO under the MMPA, as amended (16 U.S.C. 1631 *et seq*.) for the incidental taking of small numbers of marine mammals, incidental to the conduct of a low-energy marine geophysical (seismic) survey in international waters and the EEZs of Micronesia, Papua New Guinea, Indonesia, and the Philippines in the tropical western Pacific Ocean, September through October 2013. We do not have the authority to authorize or prohibit SIO's low-energy seismic survey in the tropical western Pacific Ocean.

Our proposed action is triggered by SIO requesting an IHA to take marine mammals incidental to conducting the proposed low-energy marine seismic survey within international waters and the EEZs of Micronesia, Papua New Guinea, Indonesia, and the Philippines in the tropical western Pacific Ocean. SIO's seismic survey activities have the potential to cause marine mammals to be behaviorally disturbed by exposing them to elevated levels of sound which, as we have explained, is anticipated to result in take that would otherwise be prohibited by the MMPA. SIO therefore requires an IHA for incidental take and has requested that we provide it through the issuance of an IHA under section 101(a)(5)(D) of the MMPA. Our issuance of an IHA to SIO is a major Federal action under the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.), the Council on Environmental Quality (CEQ) regulations in 40 CFR §§ 1500-1508, and NOAA Administrative Order (NAO) 216-6. Thus, we are required to analyze the effects on the human environment and determine whether they are significant such that preparation of an Environmental Impact Statement (EIS) is necessary.

This EA titled, *Environmental Assessment on the Issuance of an Incidental Harassment Authorization to Scripps Institution of Oceanography to Take Marine Mammals by Harassment Incidental to a Low-Energy Marine Geophysical Survey in the Tropical Western Pacific Ocean, September to October 2013*, addresses the potential environmental impacts of two choices available under section 101(a)(5)(D) of the MMPA, namely:

- Issue the IHA to SIO for Level B harassment take of marine mammals under the MMPA during the low-energy seismic survey, taking into account the prescribed means of take, mitigation measures, and monitoring requirements required in the IHA; or
- Not issue an IHA to SIO in which case, for the purposes of NEPA analysis only, we assume the activities would proceed and cause incidental take without the mitigation and monitoring measures prescribed in the IHA.

We have identified one action alternative as reasonable and, along with the No Action alternative, have carried two alternatives forward for evaluation in this EA.

1.1.1 Background on the Applicant's MMPA Application

SIO proposes to use the R/V *Roger Revelle* (*Revelle*), a 83 meter (m) (272.3 feet [ft]) research vessel owned by the U.S. Navy and operated under a cooperative agreement with SIO, to use conventional seismic methodology to collect data essential to understanding the complex Earth processes beneath the ocean floor. High-resolution multi-channel seismic profiles and sediment cores would be collected in the heart of the Western Pacific Warm Pool (WPWP). The goal of the proposed research and survey sites is to fill gaps in equatorial Pacific data sets, namely the lack of high-resolution records from the eastern part of the WPWP, to better understand climate variability and the controls on the hydrologic cycle in the WPWP, and a limited meridional coverage to test hypotheses related to the Plio-Pleistocene evolution of the WPWP. Survey data would also be included in a research proposal submitted to the Integrated Ocean Drilling Program (IODP) for funding consideration to extend the record of millennial climate variability in the western equatorial Pacific Ocean back to the mid-Miocene.

The NSF supports basic scientific research in the mathematical, physical, medical, biological, social, and other sciences pursuant to the National Science Foundation Act of 1950, as amended (NSF Act; 42 U.S.C. 1861-75). The NSF considers proposals submitted by organizations and makes contracts and/or other arrangements (i.e., grants, loans, and other forms of assistance) to support research activities. In 2013, a NSF-expert panel recommended a research proposal titled, *Site Survey and Coring of Potential IODP drill sites in the Western Pacific Warm Pool* (Award #1131371) for funding and ship time on the *Revelle*. As the Federal action agency, the NSF has funded SIO's proposed seismic survey in the tropical western Pacific Ocean, September through October 2013 as a part of the NSF Act of 1950. We describe the NSF-supported low-energy seismic survey in more detail in Section 2.2.

1.1.2 Marine Mammals in the Action Area

On April 5, 2013, we received an application from SIO, which reflected updates to the mitigation safety zones, incidental take requests for marine mammals, and information on marine protected areas. Marine mammals under our jurisdiction that could be adversely affected by the proposed low-energy seismic survey include:

Mysticetes

- Blue whale (*Balaenoptera musculus*)
- Fin whale (*B. physalus*)
- Bryde's whale (*B. edeni*)
- Sei whale (*B. borealis*)
- Omura's whale (*B. omurai*)
- Minke whale (*B. acutorostrata*)
- Humpback whale (*Megaptera novaeangliae*)

Odontocetes

- Blainville's beaked whale (*Mesoplodon densirostris*)
- Bottlenose dolphin (*Tursiops truncatus*)
- Cuvier's beaked whale (*Ziphius cavirostris*)
- Dwarf sperm whale (*Kogia sima*)
- False killer whale (*Pseudorca crassidens*)
- Fraser's dolphin (*Lagenodelphis hosei*)
- Ginkgo-toothed beaked whale (*M. ginkgodens*)
- Longman's beaked whale (*Indopacetus pacificus*)
- Melon-headed whale (*Peponocephala electra*)
- Killer whale (*Orcinus orca*)
- Pantropical spotted dolphin (*Stenella attenuata*)
- Pygmy killer whale (*Feresa attenuata*)
- Pygmy sperm whale (*Kogia breviceps*)
- Risso's dolphin (*Grampus griseus*)
- Rough-toothed dolphin (*Steno bredanensis*)
- Short-finned pilot whale (*G. macrorhynchus*)
- Sperm whale (*Physeter macrocephalus*)
- Spinner dolphin (*S. longirostris*)
- Striped dolphin (*S. coeruleoalba*)

1.2 BACKGROUND FOR PURPOSE AND NEED

The MMPA and Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*) prohibit "takes" of marine mammals and of threatened and endangered species, respectively, with only a few specific exceptions. The applicable exceptions in this case are an exemption for incidental take of marine mammals in sections 101(a)(5)(D) of the MMPA and 7(o)(2) of the ESA.

Section 101(a)(5)(D) of the MMPA directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if we make certain findings and provide a notice of a proposed IHA to the public for review. Entities seeking to obtain authorization for the incidental take of marine mammals under our jurisdiction must submit such a request (in the form of an application) to us. Section 101(a)(5)(D) of the MMPA also establishes a 45-day time limit for our review of the application for an IHA followed by a 30-day public notice and comment period on any proposed authorization for the incidental harassment of small numbers of marine mammals. Within 45 days of the close of the public comment period, we must either issue or deny the IHA.

In the case of a Federal action that may affect marine mammal species listed as threatened or endangered under the ESA, the action agency responsible for funding, authorizing or carrying out the action must consult with NMFS under section 7 of the ESA to ensure that its action is not likely to jeopardize a listed species or result in the adverse modification or destruction of any designated critical habitat. The section 7 consultation process for this action is described in Section 1.4.1. Consultation is completed when NMFS issues a Biological Opinion (BiOp). The BiOp includes, among other things, an Incidental Take Statement (ITS) which must specify mitigation measures included in an Incidental Take Authorization (ITA) for listed marine mammal species. Any incidental take that occurs consistent with the terms and conditions in the ITS is not considered prohibited take under the ESA and is thus exempted.

We have promulgated regulations to implement the permit provisions of the MMPA (50 CFR Part 216) and have produced Office of Management and Budget (OMB)-approved application instructions (OMB Number 0648-0151) that prescribe the procedures necessary to apply for permits. All applicants must comply with these regulations and application instructions in addition to the provisions of the MMPA. Applications for an IHA must be submitted according to regulations at 50 CFR § 216.104.

1.2.1 PURPOSE OF ACTION

The primary purpose of our proposed action, the issuance of an IHA to SIO is to authorize (pursuant to the MMPA) the SIO and NSF's request for the take of marine mammals incidental to SIO's proposed activities. The IHA, if issued, would provide an exception to the SIO from the take prohibitions contained in the MMPA and would allow take of marine mammals, incidental to the conduct of the low-energy seismic survey from September through October 2013. To authorize the take of small numbers of marine mammals in accordance with section 101(a)(5)(D) of the MMPA, we must evaluate the best available scientific information to determine whether the take would have a negligible impact on marine mammals or stocks and have an unmitigable impact on the availability of affected marine mammal species for subsistence use. We cannot issue an IHA if it would result in more than a negligible impact on marine mammals or stocks or result in an unmitigable impact on subsistence. The statute also establishes substantive

requirements. We must set forth the permissible methods of taking and other means of effecting the least practicable impact on the species or stocks of marine mammals and their habitat (i.e. mitigation), paying particular attention to rookeries, mating grounds, and areas of similar significance. If appropriate, we must prescribe means of effecting the least practicable impact on the availability of the species or stocks of marine mammals for subsistence uses. IHAs must also include requirements or conditions pertaining to the monitoring and reporting of such taking in large part to better understand the effects of such taking on the species. A proposed IHA must be published in the *Federal Register* for public notice and comment. The purpose of this action is therefore to fashion an IHA that meets statutory and regulatory requirements if it is feasible to do so.

1.2.2 NEED FOR ACTION

As noted above this section, the MMPA establishes a general moratorium or prohibition on the take of marine mammals, including take by Level B (behavioral) harassment. The MMPA establishes a process discussed in Section 1.2.1 by which individuals engaged in specified activities within a specified geographic area may request an IHA for the incidental take of small numbers of marine mammals.

On April 5, 2013, SIO submitted an application demonstrating both the need and potential eligibility for issuance of an IHA in connection with the seismic cruise described in Section 1.1.1. NMFS needs to review the IHA application to determine if the action proposed is consistent with relevant regulatory and statutory policy. We now have a corresponding duty to determine whether and how we can fashion an IHA authorizing take by Level B harassment incidental to the activities described in SIO's application. The need for this action is therefore established and framed by the MMPA and our responsibilities under section 101(a)(5)(D) of the MMPA, its implementing regulations, and other applicable requirements which will influence our decision making, such as section 7 of the ESA which is discussed in more detail below this section. In order for an alternative to be considered reasonable it must meet the statutory and regulatory requirements. The previously mentioned purpose and need guide us in developing reasonable alternatives for consideration, including alternative means of mitigating potential adverse effects. We are thus developing and analyzing alternatives of developing and issuing an IHA, not alternative means of the applicant carrying out the underlying activities described in its application. We do recognize though that mitigation measures developed and included in a final IHA might affect those activities.

1.3 THE ENVIRONMENTAL REVIEW PROCESS

NEPA compliance is necessary for all "major" Federal actions with the potential to significantly affect the quality of the human environment. Major Federal actions include activities that are fully or partially funded, regulated, conducted, or approved by a Federal agency. Because our issuance of an IHA would allow for the taking of marine mammals consistent with provisions under the MMPA and incidental to the applicant's activities, we consider this as a major Federal action subject to NEPA.

Under the requirements of NAO 216-6, the proposed issuance of IHA for incidental take of marine mammals is an action that is not categorically excluded from NEPA review. Therefore, we prepared this EA to determine whether the direct, indirect and cumulative impacts related to its issuance of the IHA for incidental take of marine mammals under the MMPA during seismic surveys in

international waters and within the EEZs of Micronesia, Papua New Guinea, Indonesia, and the Philippines in the tropical western Pacific Ocean are likely to be significant. If we deem the potential impacts to be not significant, this analysis, in combination with other analyses incorporated by reference, may support the issuance of a Finding of No Significant Impact (FONSI) for the proposed IHA.

1.3.1 Laws, Regulations, or Other NEPA Analyses Influencing the EA's Scope

We have based the scope of the proposed action and nature of the two alternatives (i.e., whether or not to issue the IHA including prescribed means of take, mitigation measures, and monitoring requirements) considered in this EA on the relevant requirements in section 101(a)(5)(D) of the MMPA. The scope of our analysis is thus bounded by our decision making discussed in Section 1.3.2. We believe this analysis, when combined with the analysis in the NSF's 2013 *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013* (LGL, 2013); and their 2011 *Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF/USGS, 2011) fully evaluate the impacts associated with this survey with mitigation and monitoring for marine mammals.

MMPA Application and Notice of the Proposed IHA

The MMPA and its implementing regulations governing the issuance of an IHA (50 CFR § 216.107) require that upon receipt of an adequate and complete application for an IHA, we must publish a notice of preliminary determinations and a proposed IHA in the *Federal Register* (FR) within 45 days.

The regulations published by the Council on Environ Environmental Quality (CEQ regulations) 40 CFR §1502.25 encourage Federal agencies to integrate NEPA's environmental review process with other environmental review laws. We rely substantially on the public process for developing proposed IHAs under the MMPA and its implementing regulations to develop and evaluate relevant environmental information and provide a meaningful opportunity for public participation as we develop corresponding EAs. We fully consider public comments received in response to our publication of the notice of proposed IHA during the corresponding NEPA review process.

On June 5, 2013, we published a notice of a proposed IHA with our preliminary determinations in the *Federal Register* (78 FR 33811). The notice included a detailed description of the revised proposed action resulting from the MMPA consultation process; consideration of environmental issues and impacts of relevance related to the issuance of an IHA; and potential mitigation and monitoring measures to avoid and minimize potential adverse impacts to marine mammals and their habitat. We explained in that notice that we would use it to provide all relevant environmental information to the public and to solicit the public's comments on the potential environmental effects related to the proposed issuance of the IHA and issues for consideration in this EA.

This EA titled, *Environmental Assessment on the Issuance of an Incidental Harassment Authorization to Scripps Institution of Oceanography to Take Maine Mammals by Harassment Incidental to a Low-Energy Marine Geophysical Survey in the Tropical Western Pacific Ocean, September to October 2013*, incorporates by reference and relies on the SIO's April 2013

application, our notice of a proposed IHA (78 FR 33811, June 5, 2013), and their environmental analyses by reference to avoid duplication of analysis and unnecessary length.

Our notice of a proposed IHA (78 FR 33811, June 5, 2013) included a detailed description of the proposed project, an assessment of the potential impacts on marine mammals, mitigation and monitoring measures, reporting requirements planned for this project and preliminary determinations required by the MMPA. The notice provided information on our proposal to issue an IHA to SIO to incidentally harass by Level B harassment only, 26 species of marine mammals during the proposed 26-day low-energy seismic survey. Within the notice of the proposed IHA (78 FR 33811, June 5, 2013) we considered the applicant's proposed action and their proposed mitigation and monitoring measures that would effect the least practicable impact on marine mammals including: (1) vessel-based visual mitigation monitoring; (2) proposed exclusion zones; (3) shutdown procedures; (4) ramp-up procedures; and (5) speed and course alterations. We preliminarily determined, provided that SIO implemented the required mitigation and monitoring measures, that the impact of conducting a proposed survey in the tropical western Pacific Ocean in international waters and within the EEZs of Micronesia, Papua New Guinea, Indonesia, and the Philippines, from September through October 2013, would result, at worst, in a modification in behavior and/or low-level physiological effects (Level B harassment) of certain species of marine mammals, both of which would be non-significant.

PROPOSING FEDERAL AGENCY'S NEPA ANALYSIS ON THE PROPOSED SEISMIC SURVEY AND ISSUANCE OF AN ASSOCIATED IHA

The NSF, which funds the project and research vessel that would serve as the operational platform for the seismic survey, directed LGL Ltd., Environmental Research Associates to prepare an environmental analysis (analysis) titled, *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013* (LGL, 2013) to meet their requirements under Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*, for NSF's proposed Federal action. The NSF's 2013 analysis tiers to the *2011 Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF, 2011) and their Record of Decision.

After conducting an independent review of the information and analyses for sufficiency and adequacy, we incorporate by reference the relevant analyses on SIO's proposed action as well as a discussion of the affected environment and environmental consequences within the following documents per 40 CFR 1502.21 and NAO 216-6 § 5.09(d):

- The NSF's 2013 *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013*, prepared by LGL Ltd., Environmental Research Associates (LGL, 2013); and
- The NSF's 2011 *Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF, 2011).

The NSF's 2013 environmental analysis (LGL, 2013) contains a description of SIO's proposed low-energy seismic survey, proposed mitigation measures, and issuance of an IHA (Section II); and a discussion of the affected environment and environmental consequences (Section IV)

(LGL, 2013). The NSF/USGS's 2011 PEIS (NSF, 2011) also considers, in a qualitative way (Section 2.3.1.2), the affected environment and environmental consequences of conducting a low-energy seismic survey in the tropical western Pacific Ocean including impacts on marine invertebrates (Section 3.2), fish (Section 3.3), sea turtles (Section 3.4), sea birds (Section 3.5), and marine mammals (Section 3.6); collision, entanglement, and ingestion (Sections 3.4.4.4; 3.5.4.4; and 3.5.5.2); and discharges of pollutants (Section 4.3.8). In summary, the NSF's analyses conclude that with incorporation of monitoring and mitigation measures proposed by SIO, the potential impacts of the proposed action to marine mammals would be would be limited to localized changes in behavior and distribution near the seismic vessel and would qualify as Level B harassment under the MMPA. The NSF did not identify any significant environmental issues or impacts.

1.3.2 SCOPE OF ENVIRONMENTAL ANALYSIS

Given the limited scope of the decision for which we are responsible (i.e., whether or not to issue the IHA which includes prescribed means of take, mitigation measures and monitoring requirements) this EA (relying on the environmental review and analyses performed by the NSF, the application and the notice of proposed IHA collectively incorporated by reference herein) is intended to provide more focused information on the primary issues and impacts of environmental concern related specifically to our issuance of the IHA authorizing the take of marine mammals incidental SIO's activities and mitigation measures to minimize the effects of that take. For these reasons, this EA does not further evaluate effects to the elements of the human environment listed in Table 1.

Table 1. Components of the human environment not requiring further evaluation.

Biological	Physical	Socioeconomic / Cultural
Non-listed Fish	Water Quality	Commercial Fishing
Non-listed Invertebrates	Essential Fish Habitat	Military Activities
Non-listed Sea Turtles	Geography	Oil and Gas Activities
	Oceanography	Recreational Fishing
	State Marine Protected Areas	Shipping and Boating
	Federal Marine Protected Areas	National Historic Preservation Sites
	National Estuarine Research Reserves	Low Income Populations
	National Marine Sanctuaries	Minority Populations
	Ecologically Critical Areas	Indigenous Cultural Resources
		Public Health and Safety
		Historic and Cultural Resources

1.3.3 NEPA PUBLIC SCOPING SUMMARY

NAO 216-6 established agency procedures for complying with NEPA and the implementing NEPA regulations issued by the CEQ. Consistent with the intent of NEPA and the clear direction in NAO 216-6 to involve the public in NEPA decision-making, we requested comments on the potential environmental impacts described in the MMPA IHA application and in the *Federal Register* notice of the proposed IHA (78 FR 33811, June 5, 2013). The CEQ regulations further encourage agencies to integrate the NEPA review process with review under the environmental statutes. Consistent with agency practice we integrated our NEPA review and preparation of this EA with the public process required by the MMPA for issuance of an IHA.

The *Federal Register* notice of the proposed IHA with our preliminary determinations (78 FR 33811, June 5, 2013), supporting analyses, and corresponding public comment period are instrumental in providing the public with information on relevant environmental issues and offering the public a meaningful opportunity to provide comments to us for consideration in both the MMPA and NEPA decision-making processes.

The *Federal Register* notice of the proposed IHA (78 FR 33811, June 5, 2013) summarized our purpose and need; included a statement that we would prepare an EA for the proposed action; and invited interested parties to submit written comments concerning the application and our preliminary analyses and findings including those relevant to consideration in the EA. The notice of the proposed IHA was available for public review and comment from June 5 to July 5, 2013.

This process served the public participation function for this EA in terms of scoping for the action and providing the public a meaningful opportunity to participate in the environmental decision-making process. In addition, we posted the NSF's analysis on our website at: http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications concurrently with the release of our *Federal Register* notice requesting comments on the proposed IHA (78 FR 33811, June 5, 2013). This EA does not expand the scope of environmental issues and impacts for consideration and is based primarily on the information included in in our *Federal Register* notice (78 FR 33811, June 5, 2013), the documents it references, and the public comments provided in response. Therefore, we did not release a draft of this EA for additional review based on our determination that its release would neither yield additional information to inform our decision making, nor provide for more meaningful public involvement. At the conclusion of this process, we will post the final EA, and, if appropriate, the FONSI, on the same website.

1.3.4 Relevant Comments on the NSF's Analysis

The NSF did not release their environmental analysis to the public. As such, they received no public comments. However, we posted the NSF's analysis on our website at http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications concurrently with the release of our *Federal Register* notice requesting comments on the proposed IHA (78 FR 33811, June 5, 2013). We evaluate and address relevant public comments that we received in response to the notice in Chapters 2, 3, and 4 of this EA. We will also address them in the *Federal Register* notice announcing issuance of the IHA, should we determine to issue the IHA.

1.3.5 Relevant Comments on our *Federal Register* Notice

During the 30-day public comment period on the notice of the proposed IHA (78 FR 33811, June 5, 2013) we received comments from one individual. Public comments on the notice of the proposed IHA postmarked by July 5, 2013 are a part of the public record and are available on our website. The comments related to the potential environmental impacts associated with our authorizing potential take of marine mammals incidental to SIO's action include:

- A request to deny the issuance of the IHA to SIO because (s)he believed that the activity would kill marine mammals in the survey area.

On June 24, 2013, we received comments from the Marine Mammal Commission (Commission) on the notice of the proposed IHA (78 FR 33811, June 5, 2013). The Commission provides comments on all proposed ITAs as part of their established role under the MMPA (§ 202 (a)(2), "*humane means of taking marine mammals"*).

We briefly summarize the Commission's comments here. Generally, the Commission recommended that we:

- Require SIO, through cooperation of the Lamont-Doherty Earth Observatory of Columbia University (L-DEO) and the NSF, to determine whether the range of sound speeds (minimums to maximums) at each of the 10 survey sites would increase the associated radii by 20 percent or more and if so, require SIO to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals accordingly.
- Require the L-DEO and NSF to test the accuracy of L-DEO's model by comparing it to the hydrophone data collected during previous surveys from environments other than the Gulf of Mexico prior to the submittal of applications to NMFS for seismic surveys to be conducted in 2014 – if L-DEO and NSF either do not have enough data to compare the L-DEO's model to other environments or do not assess the accuracy of the model, re-

estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific parameters (including sound speed profiles, bathymetry, and bottom characteristics) for all future applications that use L-DEO's model.

- (1) Require SIO to revise it take estimates to include Level B harassment takes associated with the use of the sub-bottom profiler and multibeam echosounder when the airgun is not firing, and (2) follow a consistent approach of requiring the assessment of Level B harassment takes for those types of sound sources (e.g., sub-bottom profilers, echosounders, side-scan sonar, and fish-finding sonar) by all applicants, who propose to use such sources.
- Require SIO to estimate the numbers of marine mammals taken when the sub-bottom profiler and multibeam echosounder are used in the absence of the airgun array based on the 120 dB re 1 μPa threshold rather than the 160 dB re 1 μPa threshold.
- Consult with experts in the field of sound propagation and marine mammal hearing to revise the acoustic criteria and thresholds as necessary to specify threshold levels that would be more appropriate for a wider range of sound sources, including sub-bottom profilers and echosounders.
- Require SIO to use the (1) original density estimates from Dolar *et al*. (2006) rather than the estimates that have been adjusted by an arbitrary correction factor of 0.5; (2) density estimate for Fraser's dolphins from the Sulu Sea in 1995 and 1996 rather than just 1995; and (3) adjust density estimates for all species using some measure of uncertainty (e.g., two standard deviations) and re-estimate the numbers of takes accordingly.
- Formulate policy or guidance regarding a consistent approach for how applicants should incorporate uncertainty in density estimates.
- Consult with the funding agency (i.e., NSF) and individual applicants (e.g., SIO and L-DEO) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken – the assessment should account for applicable g(0) and f(0) values.
- Work with NSF to analyze monitoring data to assess the effectiveness of ramp-up procedures as a mitigation measure for seismic surveys.

We have considered the comments regarding monitoring and mitigation measures within the context of the MMPA requirement to effect the least practicable adverse impact to marine mammals and their habitats. We have developed responses to specific comments related to the incidental harassment of marine mammals; will provide those responses in the *Federal Register* notice announcing the issuance of the IHA; and address them in Chapters 2, 3, and 4 of this EA. We fully considered the Commission's comments, particularly those related to mitigation, monitoring, and adaptive management measures in preparing the final IHA and this EA.

Based on those comments, we have re-evaluated the mitigation and monitoring proposed for incorporation in the IHA and have determined, based on the best available data that the mitigation measures proposed by the applicant are the most feasible and effective monitoring and mitigation measures to achieve the MMPA requirement of effecting the least practicable impact on each marine mammal species or stock. Public comments therefore did not reveal additional feasible means of effective mitigation for the proposed action.

1.4 OTHER PERMITS, LICENSES, OR CONSULTATION REQUIREMENTS

This section summarizes Federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action.

1.4.1 U.S. ENDANGERED SPECIES ACT OF 1973

Section 7 of the ESA requires consultation for actions funded, authorized or carried out by federal agencies (i.e., Federal actions) that may affect a species listed as threatened or endangered or that may affect designated critical habitat under the ESA. The regulations at 50 CFR § 402 specify the requirements for these consultations with the NMFS.

The NSF has requested authorization for the incidental take of the following marine mammals that are listed as endangered under the ESA under our jurisdiction: the blue, fin, sei, humpback, and sperm whales. Under section 7 of the ESA, the NSF, the lead Federal agency which funds the *Revelle*, has conducted a formal consultation with the NMFS, Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on this proposed low-energy seismic survey.

Likewise, our issuance of an IHA is an interrelated Federal action that is also subject to the requirements of section 7 of the ESA. As a result, we are required to ensure that the action of our issuance of an IHA to SIO is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species. In order for us to authorize the incidental take of blue, fin, sei, humpback, and sperm whales, we have also conducted a concurrent formal consultation with the Office of Protected Resources, Endangered Species Act Interagency Cooperation Division.

The formal consultation under section 7 of the ESA will conclude with a single Biological Opinion for the NSF's Division of Ocean Sciences and to the NMFS's Office of Protected Resources, Permits and Conservation Division for the seismic cruise and associated IHA.

1.4.2 E.O. 12114: ENVIRONMENTAL EFFECTS ABROAD OF MAJOR FEDERAL ACTIONS.

The requirements for Executive Order (E.O.) 12114 are discussed in the NSF's 2013 *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013*(LGL, 2013) and their 2011 *Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF, 2011). We have incorporated both documents by reference in this EA.

Briefly, the provisions of E.O. 12114 apply to major Federal actions that occur or have effects outside of U.S. territories (the United States, its territories, and possessions). Accordingly, the NSF prepares environmental analyses for major Federal actions which could have environmental impacts anywhere beyond the territorial jurisdiction of the United States. NOAA, as a matter of policy, prepares NEPA analyses for proposed major Federal actions occurring within its territorial waters, the U.S. EEZ, the high seas, and the EEZs of foreign nations.

CHAPTER 2 – ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

The NEPA and the implementing CEQ regulations (40 CFR §§ 1500-1508) require consideration of alternatives to proposed major Federal actions and NAO 216-6 provides agency policy and guidance on the consideration of alternatives to our proposed action. An EA must consider all reasonable alternatives, including the preferred action. It must also consider the no action alternative, even if it does not meet the stated purpose and need, so as to provide a baseline analysis against we can compare the action alternative.

To warrant detailed evaluation as a reasonable alternative, an alternative must meet our purpose and need. In this case, as we previously explained, an alternative will only meet the purpose and need if it satisfies the requirements under section 101(a)(5)(D) the MMPA (see Chapter 1), which serves as the alternative's only screening criteria. We evaluated each potential alternative against these criteria. Based on this evaluation, we have identified one action alternative as reasonable and, along with the No Action alternative, have carried two alternatives forward for evaluation in this EA.[1]

We did not carry forward alternatives that we considered not reasonable for detailed evaluation in this EA. Section 2.3.4 presents alternatives considered but eliminated from further review. The action alternative includes a suite of mitigation measures intended to minimize potentially adverse interactions with marine mammals. This chapter describes both alternatives and compares them in terms of their environmental impacts and their achievement of objectives.

As described in Section 1.2.1, we must prescribe the means of effecting the least practicable adverse impact on the species or stocks of marine mammals and their habitat. In order to do so, we must consider SIO's proposed mitigation measures, as well as other potential measures, and assess the benefit of the considered measures to the potentially affected species or stocks and their habitat. Our evaluation of potential measures includes consideration of the following factors in relation to one another: (1) the manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals; (2) the proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and (3) the practicability of the measure for applicant implementation.

Any additional mitigation measure proposed by us beyond what the applicant proposes should be able to or have a reasonable likelihood of accomplishing or contributing to the accomplishment of one or more of the following goals:

- Avoidance or minimization of marine mammal injury, serious injury, or death wherever possible;
- A reduction in the numbers of marine mammals taken (total number or number at biologically important time or location);

[1] For instances involving Federal decisions on proposals for projects, the single action alternative would consider the effects of permitting the proposed activity which would be compared to "No action" alternative. In this case, the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity to proceed (NEPA; Section 1502.14(d)). 40 CFR Sec. 1508.23 states that if an agency subject to NEPA has a goal and is actively preparing to make a decision on one or more alternative means of accomplishing that goal, the effects can be meaningfully evaluated.

- A reduction in the number of times individual marine mammals are taken (total number or number at biologically important time or location);
- A reduction in the intensity of the anticipated takes (either total number or number at biologically important time or location);
- 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; and
- For monitoring directly related to mitigation, an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

2.2 DESCRIPTION OF SIO'S PROPOSED SEISMIC SURVEY

SIO plans to conduct a low-energy seismic and sediment coring surveys at 10 sites in the tropical western Pacific Ocean in September to October 2014 (see Figure 1). SIO plans to use one source vessel, the *Revelle*, and a seismic airgun array to collect seismic data in the tropical western Pacific Ocean. The SIO plans to use conventional low-energy, seismic methodology to fill gaps in equatorial Pacific data sets, namely the lack of high-resolution records from the eastern part of the WPWP to better assess controls on the hydrologic cycle in the WPWP, and a limited meridional coverage to test hypotheses related to the Plio-Pleistocene evolution of the WPWP. In addition to the planned operations of the seismic airgun array and hydrophone streamer, SIO intends to operate a multibeam echosounder and sub-bottom profiler continuously throughout the survey.

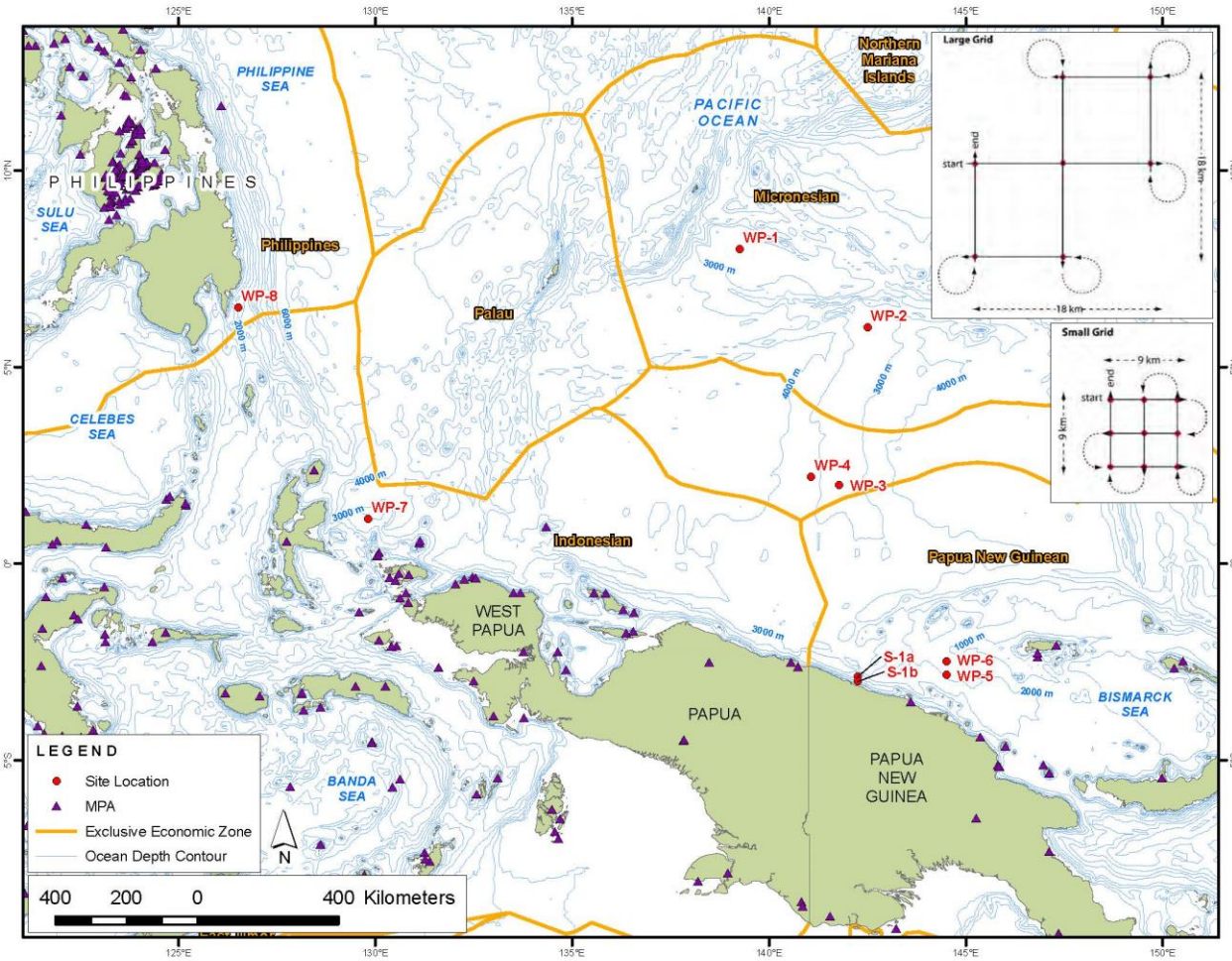

Figure 1. Locations of the proposed low-energy seismic survey and coring sites in the tropical western Pacific Ocean, September through October 2013.

2.2.1 SPECIFIED TIME AND SPECIFIED AREA

SIO's proposed low-energy seismic survey and survey sites are located between approximately 4 º South to 8º North and approximately 126.5 to 144.5º East in international waters and in the EEZs of Micronesia, Papua New Guinea, Indonesia, and the Philippines in the tropical western Pacific Ocean. The cruise will be in water depths from approximately 450 to 3,000 m (1,476.4 to 9,842.5 ft). The *Revelle* would depart from Lae, Papua New Guinea on approximately September 6, 2013 and arrive in Manila, Philippines on approximately October 1, 2013 (see Table 1 of the IHA application for the order of survey sites). Seismic operations would take approximately 14 to 20 hours at each of the 10 sites, and total transit time to the first site, between all sites, and from the last site would be approximately 13 days. The remainder of the time, approximately 6 days, would be spent collecting sediment cores at 10 sites, for a total of 26 operational days. Some minor deviation from these dates is possible, depending on logistics, weather conditions, and the need to repeat some lines if data quality is substandard. Therefore, we propose to issue an IHA that is effective from September 6, 2013 to November 12, 2013.

Table 2. Survey patterns and lengths at each survey site in the tropical western Pacific Ocean during September to October 2013.

Survey Site	Survey Pattern (km)	Survey Length (km)
WP-5	9 x 9 (4.9 x 4.9 nmi)	82.2 (44.4 nmi)
WP-6	9 x 9 (4.9 x 4.9 nmi)	82.2 (44.4 nmi)
S-1a, S-1b	30 x 26 (16.2 x 14)	349.5 (188.7)
WP-3	9 x 9 (4.9 x 4.9 nmi)	82.2 (44.4 nmi)
WP-4	9 x 9 (4.9 x 4.9 nmi)	82.2 (44.4 nmi)
WP-2	9 x 9 (4.9 x 4.9 nmi)	82.2 (44.4 nmi)
WP-1	9 x 9 (4.9 x 4.9 nmi)	82.2 (44.4 nmi)
WP-7	9 x 9 (4.9 x 4.9 nmi)	82.2 (44.4 nmi)
WP-8	18 x 18 (9.7 x 9.7 nmi)	108 (58.3 nmi)
Total		1,032.9 (557.7 nmi)

[1] Sites are listed in the intended order in which surveys would be conducted.

2.2.2 Seismic Acquisition and Active Acoustic Operations

The NSF's analysis titled, *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013*, (NSF, 2013); SIO's application; and our notice of the proposed IHA (78 FR 33811, June 5, 2013) describe the survey protocols in detail. We incorporate those descriptions by reference in this EA and briefly summarize them here.

The proposed low-energy seismic survey will involve one source vessel, the *Revelle*, which would deploy a two 45 cubic inch (in^3) GI airgun array, with a total volume of approximately 90 in^3 at a tow depth of 2 m (6.6 ft). The acoustic receiving system will consist of one 600 m (1,968.5 ft) long hydrophone streamer. The airgun array is towed through the water column along the survey lines, introducing sound into the water column. Airguns function by venting high-pressure air into the water, which creates an air bubble that transmits sounds downward through the seafloor (NSF/USGS, 2011). The sound penetrates the seafloor and returns to a receiver called a hydrophone and the reflected data provides information on sub-sea floor layers. The hydrophone streamers would receive the returning acoustic signals and transfer the data to the on-board processing system. The Principal Investigators are Drs. Y. Rosenthal and G. Mountain of Rutgers University.

Straight survey lines will be collected in a grid of intersecting lines. Seven sites would be centered in small 9 x 9 km (4.9 x 4.9 nmi) grids of six intersecting lines (see Figure 1 above). One site warrants slightly longer lines and would be surveyed in a large 18 x 18 km (9.7 x 9.7 nmi) grid of six intersection lines. Finally, sites S-1a and S-1b are close enough that efficiency in ship use would be achieved by covering both with a single grid of intersecting lines in a 30 x 26 km (16.2 x 14 nmi). Individual survey lines in this grid would be approximately 5 to 10 km (2.7 to 5.4 nmi) apart. The total track distance of survey data, including turns, would be approximately 1,033 km (557.8 nmi). Barring re-organization because of weather considerations

or results that develop from data analyzed as sites are completed, sites would be surveyed in the order summarized in Table 2. All planned seismic data acquisition activities will be conducted by technicians provided by SIO with onboard assistance by the scientists who have planned the study. The vessel will be self-contained, and the crew will live aboard the vessel for the entire cruise.

The *Revelle* would tow the pair of GI airguns would be towed 8 m (26.3 ft) apart side-by-side, 21 m (68.9 ft) behind the vessel, at a depth of 2 m. Seismic pulses would be emitted at intervals of approximately 10 seconds (25 m [82 ft]). At a speed of 5 knots (11.1 km/hour), the 6 to 10 second spacing would correspond to a shot interval of approximately 18.5 to 31 m (60.7 to 101.7 ft) (see Figure 2-14, page 2-28 in the NSF's *2011 Final Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF/USGS, 2011). During firing, the airguns would emit a brief (approximately 0.1 second [s]) pulse of sound; during the intervening periods of operations, the airguns are silent.

The nominal source levels of the airgun array on the *Revelle* are 224.6 to 229.8 decibels (dB) re: 1 μPa (peak to peak) and the root mean square (rms) value for a given airgun pulse is typically 16 dB re: 1 μPa lower than the peak-to-peak value (Greene, 1997). The specific source output for the two airgun array is 230.6 dB (peak) and 235.8 dB (peak-peak). However, the difference between rms and peak or peak-to-peak values for a given pulse depends on the frequency content and duration of the pulse, among other factors[2]. During firing, a brief (approximately 0.1 s) pulse sound is emitted; the airguns would be silent during the intervening periods. The dominant frequency components range from 0 to 188 Hertz (Hz).

The proposed study (*e.g.*, equipment testing, startup, line changes, repeat coverage of any areas, and equipment recovery) would consist of approximately 1,032.9 km (557.7 nmi) of transect lines (including turns) in the survey area in the tropical western Pacific Ocean. The *Revelle* may conduct additional seismic operations in the survey area associated with turns, airgun testing, and repeat coverage of any areas where the initial data quality is sub-standard.

The *Revelle* would also operate a Kongsberg EM 122 multibeam echosounder and a Knudsen Chirp 3260 sub-bottom profiler concurrently during airgun operations to map characteristics of the ocean floor and to provide information about the sedimentary features and bottom topography. This sound source would be operated continuously from the *Revelle* throughout the cruise between the first and last survey sites. The nominal source levels for the multibeam echosounder and sub-bottom profiler are 242 dB re: 1 μPa and 222 dB re: 1 μPa, respectively.

[2] Sound pressure is the sound force per unit area, and is usually measured in micropascals (μPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level (SPL) is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in underwater acoustics is 1 μPa, and the units for SPLs are dB re: 1 μPa. SPL (in decibels [dB]) = 20 log (pressure/reference pressure). SPL is an instantaneous measurement and can be expressed as the peak, the peak-peak (p-p), or the root mean square (rms). Root mean square, which is the square root of the arithmetic average of the squared instantaneous pressure values, is typically used in discussions of the effects of sounds on vertebrates and all references to SPL in this document refer to the root mean square unless otherwise noted. SPL does not take the duration of a sound into account.

2.2.3 Piston Core, Gravity Core, and Multicore Description and Deployment

The piston corer to be used on the Revelle consists of a piston core with a 10 cm (X in) diameter steel barrel up to approximately 18 m (59.1 ft) long with a 2,300 kilogram (kg) (5,070.6 pound [lb]) weight and trigger core with a 10 cm (3.9 in) diameter PVC plastic barrel 3 m (9.8 ft) long with a 230 kg (507.1 lb) weight), which are lowered concurrently into the ocean floor with 1.4 cm (0.6 in) diameter steel cables.

The gravity core consists of a 6 m (19.7 ft) long core pipe that takes a core sample approximately 10 cm in diameter, a head weight approximately 45 cm (17.7 in) in diameter, and a stabilizing fin. It is lowered to the ocean floor with a 1.4 cm diameter steel cable at 100 m/minute (328.1 ft/minute) speed.

The multicore consists of an outer 8-legged cone shaped frame and a weighted inner frame that holds up to 8 plastic core sampling tubes 80 cm (31.5 in) long and approximately 10 cm in diameter. The outer frame is lowered to the bottom, and inner frame is then released to allow the sampling tubes to penetrate the sediment. At each of the 10 sites, one each type of core would be collected.

2.3 Description of Alternatives

2.3.1 Alternative 1 – Issuance of an Authorization with Mitigation Measures

The Proposed Action constitutes Alternative 1 and is the Preferred Alternative. Under this alternative, we would issue an IHA (valid from September through October 2013) to SIO allowing the incidental take, by Level B harassment, of 26 species of marine mammals during the 26-day low-energy seismic survey subject to the mandatory mitigation and monitoring measures and reporting requirements set forth in the IHA, if issued.

The NSF's analyses and our *Federal Register* notice requesting comments on the proposed IHA (78 FR 33811, June 5, 2013) analyzed the potential impacts of this alternative in detail. We incorporate those analyses by reference in this EA and briefly summarize the mitigation and monitoring measures and reporting requirements likely to be incorporated in the final IHA, if issued, in the following sections.

We preliminarily determined, under section 101(a)(5)(D) of the MMPA that the measures included in the proposed IHA were sufficient to reduce the effects of SIO's activity on marine mammals to the level of least practicable adverse impact. In addition, we preliminarily determined that the taking of small numbers of marine mammals incidental to SIO's action would have a negligible impact on the affected species or stocks (78 FR 33811, June 5, 2013).

We have not altered the mitigation, monitoring and reporting requirements to be included in the final IHA; nor have we received any information that would cause us to change our negligible impact or small numbers determinations. Accordingly, this Preferred Alternative (Issuance of an IHA with Mitigation Measures) would satisfy the purpose and need of our proposed action under the MMPA–issuance of an IHA, along with required mitigation measures and monitoring, and would enable us, the NSF and SIO to comply with the statutory and regulatory requirements of the MMPA and ESA.

MITIGATION AND MONITORING MEASURES

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

(1) establishment of exclusion zones to avoid injury to marine mammals and visual monitoring of the exclusion zones by Protected Species Observers (PSOs);

(2) shut-down procedures when PSOs detect marine mammals within or about to enter the exclusion zones while the airgun is operating at full volume;

(3) ramp-up procedures; and

(4) speed or course alterations to avoid marine mammals entering the exclusion zone(s).

Proposed Buffer and Exclusion Zones: We have established various threshold criteria for injury and harassment that may result from exposure to acoustic stimuli. These thresholds are expressed as the root mean square (rms) of all sound amplitudes measured over the duration of an impulse with a base unit of decibels referenced to one micropascal (re: 1 µPa (rms)); the relevant thresholds for SIO's action are 180 dB re: 1 µPa (rms) for potential injury to cetaceans; and 160 dB re: 1 µPa (rms) for potential Level B (behavioral) harassment from pulsed sounds (e.g., airguns).

SIO will establish a 160 and 180 dB re 1 µPa (rms) buffer and exclusion zone for cetaceans before starting the two GI airgun array (90 in^3) based upon the modeled radii in their application and shown here in Table 3.

Table 3. Measured (array) and predicted (single airgun) distances by L-DEO to which sound levels greater than or equal to 160 and 180 dB re: 1 µPa could be received in intermediate and deep water during the proposed low-energy seismic survey in the tropical western Pacific Ocean, during September through October 2013.

Source and Total Volume (in^3)	Tow Depth (m)	Water Depth (m)	Predicted RMS Radii Distances[1] (m)	
			160 dB	180 dB
Two GI Airguns (90 in^3)	2	Intermediate (100 to 1,000)	600 (1,968.5 ft)	100 (328 ft)
Two GI Airguns (90 in^3)	2	Deep (>1,000)	400 (1,312.3 ft)	100 (328 ft)

NMFS has determined that for acoustic effects, using acoustic thresholds in combination with corresponding exclusion zones are an effective way to consistently apply measures to avoid or minimize the impacts of an action. SIO uses the thresholds to establish a mitigation shut-down or exclusion zone, i.e., if an animal enters or about to enter an area calculated to be ensonified above the level of an established threshold a sound source is shut-down.

Shut-Down Procedures: SIO would shut-down the operating airgun(s) if they see a marine mammal within or approaching the exclusion zone for the single or two airguns. SIO would not resume airgun activity until the marine mammal(s) has cleared the exclusion zone, or until the PSO is confident that the animal has left the vicinity of the vessel.

Ramp-Up Procedures: SIO would initiate a ramp-up procedure, beginning with a single airgun in the array and then adding the second airgun after five minutes when beginning operations, and after a specified period (approximately 15 minutes) of non-active airgun operations when a shut-down has exceeded that period. SIO, U.S. Geological Survey (USGS), and L-DEO has used similar periods during previous surveys.

Speed and/or Course Alteration: If a marine mammal is detected outside the applicable exclusion zone and, based on its position and the relative direction of travel, is likely to enter the exclusion zone, SIO would consider changes of the vessel's speed and/or direct course if this does not compromise operational safety. This would be done if operationally practicable while minimizing the effect on the planned science objectives. For marine seismic surveys using large streamer arrays, course alterations are not typically possible. After any such speed and/or course alteration is begun, the marine mammal activities and movements relative to the seismic vessel will be closely monitored to ensure the marine mammal does not approach within the exclusion zone. If the marine mammal appears likely to enter the exclusion zone, further mitigation actions would be taken, including further course alterations or shut-down of the airgun(s).

Visual Monitoring: During seismic operations, SIO would place at least two PSOs aboard the *Revelle* for the duration of the cruise. One PSOs would watch for marine mammals near the vessel during daytime airgun operations (from civil twilight-dawn to civil twilight-dusk) and during any ramp-ups at night. At least one visual PSO will be on watch during meal times and restroom breaks and the PSO shifts would last no longer than four hours at a time.

PSOs would record data to estimate the numbers of marine mammals exposed to various received sound levels and to document reactions or lack thereof. PSOs would also observe during daytime periods when the seismic system is not operating for comparison of sighting rates and behavior with versus without airgun operations. They would also provide information needed to order a shut-down of the seismic source when a marine mammal is within or near the exclusion zone. SIO would use the data to estimate numbers of animals potentially 'taken' by harassment (as defined in the MMPA).

REPORTING MEASURES

SIO would submit a comprehensive report to us and the NSF within 90 days after the end of the cruise. The report would describe the operations that were 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 (i.e., dates, times, locations, activities, and associated seismic survey activities). The report would also include estimates of the number and nature of exposures that could result in takes of marine mammals by harassment or in other ways.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA (if issued), such as an injury (Level A harassment), serious injury or mortality (*e.g.*, ship-strike, gear interaction, and/or entanglement), SIO shall immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources. SIO may not resume activities until we are able to review the circumstances of the prohibited take.

2.3.2 ALTERNATIVE 2 – NO ACTION

We are required to evaluate the No Action Alternative per CEQ NEPA regulations (C.F.R. § 1502.14). The No Action Alternative serves as a baseline to compare the impacts of the Proposed Action.

Under the No Action Alternative, we would not issue an IHA to SIO for the taking, by Level B harassment, of small numbers of marine mammals, incidental to the conduct of a low-energy seismic survey in international waters and within the EEZs of Micronesia, Papua New Guinea, Indonesia, and Philippines in the tropical western Pacific Ocean, September through October 2013. For the purposes of this EA, NMFS assumes under the No Action Alternative that SIO would conduct the proposed low-energy seismic survey without an exemption from the MMPA against the take of marine mammals. NMFS also assumes that SIO will conduct the low-energy seismic survey in the absence of the protective monitoring and mitigation measures for marine mammals that would be required by the IHA.

2.3.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

We also considered an alternative whereby we issue the IHA for another time. However, this alternative failed to meet the statutory and regulatory requirements of the MMPA for an IHA as SIO did not request nor submit an application (i.e., under the MMPA the Secretary shall issue an IHA upon request) to conduct the seismic survey at an alternate time. Further, the NSF in its 2013 *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013*(LGL, 2013) considered an alternative to conducting the project at another time.

The proposed dates for the cruise (September through October 2013) are the most suitable dates that would best meet the purpose and need for the applicant, from a logistical perspective, for SIO, the *Revelle* and its crew, and the NSF. Because the proposed dates for the cruise (26 days in September to October 2013) are the dates when the personnel and equipment essential to meet the overall project objectives are available, we did not consider this alternative further.

The potential environmental impacts of this alternative would be similar to the impacts of the proposed action (Alternative 1).

CHAPTER 3 – AFFECTED ENVIRONMENT

This chapter describes existing conditions in the project area. Complete descriptions of the physical, biological, and social environment of the action area are in the NSF's 2013 *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013* (LGL, 2013) and their 2011 *Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF, 2011) . We incorporate those descriptions by reference and briefly summarize or supplement the relevant sections for marine mammals in the following subchapters.

3.1 PHYSICAL ENVIRONMENT

We are required to consider impacts to the physical environment under NOAA NAO 216-6. As discussed in Chapter 1, our proposed action and alternatives relate only to the authorization of incidental take of marine mammals and not to the physical environment. Certain aspects of the physical environment are not relevant to our proposed action (see subchapter 1.3.2 - Scope of Environmental Analysis). Because of the requirements of NAO 261-6, we briefly summarize the physical components of the environment here.

3.1.1 MARINE MAMMAL HABITAT

The proposed survey area is in the tropical western Pacific Ocean in International Waters and in the EEZs of Micronesia, Papua New Guinea, Indonesia, and the Philippines. The study sites can be found in the Philippine Sea, Celebes Sea, Banda Sea, and Bismark Sea. The bathymetry in the proposed survey area varies from shallow coral reefs to deep ocean basins and trenches. Within the project area where the proposed activities would take place, the slope or deep (greater than 1,000 m) offshore waters, and open water habitats support a variety of marine mammal species. Water depths in the proposed survey area range from 450 to 3,000 m (1,476.4 to 9,842.5 ft). No pinnipeds are known to occur in the proposed survey area.

The WPWP, a major oceanographic feature in the proposed survey area, is defined as a pool of warm, tropical, low-salinity, surface water that is 28º Celsius and persists between 10º North and 10º South, from Indonesia to 170º West. The pool undergoes large annual variations in its horizontal extent, which are probably related to fluctuations of the circulation of the subtropical gyres. The WPWP loses water through the Indonesian Archipelago (Wyrtki, 1989).

More information on the commercial and artisanal fisheries (e.g., target species, gear types, etc.) in the EEZs of Micronesia, Papua New Guinea, Indonesia, and the Philippines can be found in NSF's *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013* (available at: http://www.nmfs.noaa.gov/pr/pdfs/permits/scripps_westernpacific_ea2013_draft.pdf), which we incorporate here by reference.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 MARINE MAMMALS

We provide information on the occurrence, distribution, population size, and conservation status for each of the species of marine mammal, including 26 marine mammal species under our jurisdiction that may occur in the proposed survey area, including 7 mysticetes (baleen whales), and 19 odontocetes (toothed cetaceans) during September through October, 2013. More information on the status, abundance, and seasonal distribution of the stocks or species of marine

mammals likely to be affected by the proposed activities can be found in NSF's *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013* (available at: http://www.nmfs.noaa.gov/pr/pdfs/permits/scripps_westernpacific_ea2013_draft.pdf), which we incorporate here by reference.

We presented this information earlier in Section 1.1.2 in this EA and in Tables 3 in the *Federal Register* notice requesting comments on the proposed IHA (78 FR 33811, June 5, 2013) and we incorporate those descriptions by reference here. Table 4 (see below) presents information on the habitat, regional abundance, and conservation and population status of marine mammals that may occur in or near the proposed low-energy seismic survey in the tropical western Pacific Ocean.

All of the marine mammals are protected under the MMPA and several of these species are listed as endangered under the ESA and thus depleted under the MMPA, including the blue, fin, humpback, sei, and sperm whales (see Table 4 below). More information on the blue, fin, humpback, sei and sperm whales in the proposed study area can be found below:

Blue whale – The North Pacific stock of blue whales is thought to winter off Taiwan, Japan, and Korea. There have also been blue whale calls recorded off Midway and Oahu, Hawaii, suggesting that blue whales occur within several hundred kilometers of these islands (NMFS, 1998). Blue whale calls monitored from the U.S. Navy Sound Surveillance System and other offshore hydrophones suggest that separate populations occur in the eastern and western North Pacific (Stafford *et al*., 1999, 2001, 2007; Watkins *et al*. 2000; Stafford, 2003). Moore *et al*. (2002) reported that blue whale calls are received in the North Pacific year-round. The current distribution of blue whales in the western North Pacific is largely unknown, and little information is available on blue whale wintering areas (Perry *et al*., 1999). However few blue whales have been reported recently in the western North Pacific (Sears and Perrin, 2009). The blue whale is also considered rare in the Southern Hemisphere (Sears and Perrin, 2009). However, there have been confirmed sightings in Indonesia (Rudolph *et al*., 1997; Kahn and Pet, 2003) and the Solomon Islands (Miller, 2007; SPREP, 2012). There are no records of blue whales in or near the proposed survey area in the OBIS database.

Fin whale – Northern and southern fin whale populations are distinct, and are sometimes recognized as different sub-species (Aguilar, 2009). The current distribution of fin whales in the western North Pacific is largely unknown. Fin whales migrate in the open oceans and their winter breeding areas are mostly uncertain; however, they are known to winter in the Yellow, East China, and South China seas (Parsons *et al*., 1995; Rudolph and Smeenk, 2002). Fin whales could be resident in the East China Sea (Jefferson *et al*., 2008). De Boer (2000) reported one fin whale sighting during surveys of the South China Sea. There are also a few records for Indonesia (Rudolph *et al*., 1997). A recent review of fin whale distribution in the North Pacific noted the lack of sighting across the pelagic waters between eastern and western winter areas (Mizroch *et al*., 2009). No fin whales were sighted or detected acoustically during the January to April 2007 survey in the waters of the Mariana Islands (SRS-Parsons *et al*., 2007; Fulling *et al*., 2011). There are no records for Palau, Micronesia, Papua New Guinea, or the Solomon Islands (Miller, 2007; SPREP, 2012). In addition, there are no OBIS records of fin whales within or near the proposed survey area (IOC, 2013). It is unlikely that fin whales would be encountered during the proposed surveys.

Humpback whale – Humpback whales occur throughout most of the Pacific, but are rare in the equatorial region (Jefferson *et al*., 2008). In the western North Pacific, humpback whales are known to winter and calve around Ogasawara and Ryukyu Islands in southern Japan, Taiwan, and the Babuyan Islands in Luzon Strait in the northern Philippines (Perry *et al*., 1999; Acebes and Lesaca, 2003; Acebes *et al*., 2007; Calambokidis *et al*., 2008). Singing humpback whales have been detected in both deep and shallow waters of the Mariana Islands, suggesting a small wintering population in the region (SRS-Parsons *et al*., 2007). However, Shimada and Miyashita (2001) did not report any sightings of humpback whales during February to March surveys of the Mariana Islands or Micronesia.

There are several distinct breeding grounds in the South Pacific Ocean, including eastern Australia and Oceania (Anderson et al., 2010; Garrigue *et al*., 2011a). Although genetic evidence also indicates several discrete breeding grounds within Oceania, including New Caledonia, Tonga, and French Polynesia (Olavarria *et al*., 2003, 2007), some movement has been shown between breeding areas within Oceania (Garrigue *et al*., 2002, 2011a; Clapham *et al*., 2008) and between Oceania and eastern Australia (Anderson *et al*., 2010; Garrigue *et al*., 2011b). Constantine *et al*. (2010) noted that Oceania is the least abundant breeding ground in the Southern Hemisphere, with an estimated population size of 3,520.

During surveys in February to March 1999 to 2001, Shimada and Miyashita (2001) did not report any sightings of humpback whales north of Papua New Guinea (SPREP, 2012) and unconfirmed records for the Solomon Islands (Miller, 2007). There is one OBIS record for humpback whales in the proposed survey area off western Papua New Guinea; there are an additional two records for the Solomon Islands (IOC, 2013). The occurrence of humpback whales in Indonesia is unconfirmed; there has been a possible sighting in the Celebes Sea (Rudolph *et al*., 1997).

The available evidence suggests that humpback whales would be uncommon through the proposed survey area. However, it is possible that some individuals could be encountered off Papua New Guinea. Encounters in other parts of the study area, particularly north of the equator would be unlikely, as most humpbacks would be on higher-latitude feeding grounds during the time of the proposed surveys.

Sei whale – In the western North Pacific, the sei whale can be found across the Bering Sea and off the coasts of Japan and Korea in summer. Its occurrence in the South China Sea is unconfirmed (Rudolph and Smeenk, 2009), although Chou (2004) reported on records for this species in Taiwan. Its winter distribution is concentrated at approximately 20º North. During January to April surveys of the Mariana Islands, Bryde's and sei whales were the most frequently encountered baleen whales (SRS-Parsons et al., 2007; Fulling *et al*., 2011). No breeding grounds have been identified for sei whales anywhere in its range; however, calving is thought to occur from September to March. Sei whales have not been reported for Palau (SPREP, 2012).

Sei whales are generally not found north of 30º South in the southern hemisphere, but could occasionally visit the southern portion of the proposed study area during the austral winter (Reeves *et al*., 1999). There are sei whale records for Papua New Guinea and New Caledonia, but they have not been reported for the Solomon Islands (Miller, 2007; SPREP, 2012). Although there are records of sei whales for Indonesia, no recent sightings have been made (Rudolph *et a*l., 1997).

There are no records of sei whales within or near the proposed survey area in the OBIS database (IOC, 2013). In addition, the range of sei whales indicated by Jefferson *et al*. (2008) does not include the area where the proposed surveys would take place. Although sei whales are known to occur in the Mariana Islands, it is unlikely that they would occur in Micronesia during the time of the proposed surveys, as they prefer colder temperature waters during summer. It is possible, although unlikely, that sei whales could be encountered off Papau New Guinea.

Sperm whale – The sperm whale is known to occur in Southeast Asia, including the South China Sea (De Boer, 2000), Indonesia (Rudolph *et al*., 1997; Kahn and Pet, 2003), and the Philippines (Acebes and Lesaca, 2003; Dolar *et al*., 2006). Miyazaki *et al*. (1996) reported sperm whales during January to March surveys off eastern Mindanao, Philippines, during 1993 to 1995. During surveys off northern West Papua, Indonesia, Borsa, and Nugroho (2010) reported five sightings of sperm whales and an encounter rate of 0.005 whales/km, but none of the sightings were made in the Halmahera Sea. Strandings have also been reported for Papua and West Papua (Wild And Science, 2013).

The sperm whale is the most common large cetacean (except perhaps for Bryde's whale) in the Pacific Islands region (Reeves *et al*., 1999), and the most widespread cetacean species in that area (SPRE, 2007). Sperm whales were sighted in and near the proposed study area during surveys in February to March 1999 to 2001 in Micronesia, north of Papua New Guinea, and the Solomon Islands (Shimada and Miyashita, 2001). Miyazaki and Wada (1978) also reported sperm whale sightings during surveys in January to March 1976 north of Papua New Guinea and in the Solomon Islands. The Bismarck Sea in Papua New Guinea appears to be an important breeding ground for sperm whales; mother/calf pairs and mature males have been seen in this area (Madsen *et al*., 2002).

The sperm whale was the most frequently sighted cetacean during surveys in January to April 2007 in the Marianas (SRS-Parsons *et al*., 2007; Fulling *et al*., 2011); historically, they occurred there year-round (Townsend, 1935). There are also known to occur in Palau (SPREP, 2012). In the OBIS database, there is one sperm whale record at 13.5º North, 144º East, north of the proposed survey area, two records off northeastern Papua New Guinea, and three records for the Solomon Islands (IOC, 2003). Thus, sperm whales are lightly to be sighted during the proposed surveys.

Table 4. The habitat, regional abundance, and conservation status of marine mammals that may occur in or near the low-energy seismic survey area in the tropical western Pacific Ocean. (See text and Table 3 in SIO's application for further details.)

Species	Habitat	Population Estimate	ESA[1]	MMPA[2]
Mysticetes				
Humpback whale (*Megaptera novaeangliae*)	Pelagic, nearshore waters, and banks	3,520[3]	EN	D
Minke whale (*Balaenoptera acutorostrata*)	Pelagic and coastal	25,000[4]	NL	NC
Bryde's whale (*Balaenoptera edeni*)	Pelagic and coastal	21,000[5]	NL	NC
Omura's whale (*Balaenoptera omurai*)	Pelagic and coastal	NA	NL	NC
Sei whale (*Balaenoptera borealis*)	Primarily offshore, pelagic	7,260 to 12,620[6]	EN	D
Fin whale (*Balaenoptera physalus*)	Continental slope, pelagic	13,620 to 18,680[7]	EN	D
Blue whale (*Balaenoptera musculus*)	Pelagic, shelf, coastal	NA	EN	D
Odontocetes				
Sperm whale (*Physeter macrocephalus*)	Pelagic, deep sea	29,674[8]	EN	D
Pygmy sperm whale (*Kogia breviceps*)	Deep waters off the shelf	NA	NL	NC
Dwarf sperm whale (*Kogia sima*)	Deep waters off the shelf	11,200[9]	NL	NC
Cuvier's beaked whale (*Ziphius cavirostris*)	Pelagic	20,000[9]	NL	NC
Longman's beaked whale (*Indopacetus pacificus*)	Pelagic	NA	NL	NC
Ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*)	Pelagic	25,300[10]	NL	NC
Blainville's beaked whale (*Mesoplodon densirostris*)	Pelagic	25,300[10]	NL	NC
Killer whale (*Orcinus orca*)	Pelagic, shelf, coastal	8,500[9]	NL	NC
Short-finned pilot whale	Pelagic, shelf coastal	53,608[12]	NL	NC

(*Globicephala macrorhynchus*)				
False killer whale (*Pseudorca crassidens*)	Pelagic	16,668[12]	NL	NC
Melon-headed whale (*Peponocephala electra*)	Pelagic	45,400[9]	NL	NC
Pygmy killer whale (*Feresa attenuata*)	Pelagic	38,900[9]	NL	NC
Risso's dolphin (*Grampus griseus*)	Deep water, seamounts	83,289[12]	NL	NC
Bottlenose dolphin (*Tursiops truncatus*)	Offshore, inshore, coastal, estuaries	168,792[12]	NL	NC
Rough-toothed dolphin (*Steno bredanensis*)	Pelagic	107,633[11]	NL	NC
Fraser's dolphin (*Lagenodelphis hosei*)	Pelagic	289,300[9]	NL	NC
Striped dolphin (*Stenella coeruleoalba*)	Pelagic	570,038[13]	NL	NC
Pantropical spotted dolphin (*Stenella attenuata*)	Coastal, pelagic	438,064[11]	NL	NC
Spinner dolphin (*Stenella longirostris*)	Coastal, pelagic	734,837[13]	NL	NC
Sirenians				
Dugong (*Dugong dugon*)	Coastal	NA	EN	D

NA = Not available or not assessed.
[1] U.S. Endangered Species Act: EN = Endangered, T = Threatened, DL = Delisted, NL = Not listed.
[2] U.S. Marine Mammal Protection Act: D = Depleted, S = Strategic, NC = Not Classified.
[3] Oceania (Constantine *et al*., 2010).
[4] Northwest Pacific and Okhotsk Sea (IWC, 2013).
[5] Western North Pacific (IWC, 2013).
[6] North Pacific (Tillman, 1977).
[7] North Pacific (Ohsumi and Wada, 1974).
[8] Western North Pacific (Whitehead, 2002).
[9] Eastern Tropical Pacific (Wade and Gerrodette, 1993).
[10] Eastern Tropical Pacific, all Mesoplodon spp. (Wade and Gerrodette, 1993)
[11] Eastern Tropical Pacific (Gerrodette *et al*., 2008).
[12] Western North Pacific (Miyashita, 1993).
[13] Whitebelly stock in Eastern Tropical Pacific (Gerrodette *et al*., 2008).

3.2.2 PROTECTED SPECIES (OTHER THAN MARINE MAMMALS)

More information on five species of ESA-listed sea turtles (i.e., leatherback [*Dermochelys coriacea*], green [*Chelonia mydas*], loggerhead [*Caretta caretta*], hawksbill [*Eretmochelys imbricata*]) likely to be affected by the proposed activities and two species of ESA-listed seabirds (i.e., Christmas Island or Andrew's frigatebird [*Fregata andrewsi*] and Heinroth's shearwater [*Puffinus heinrothi*]) that could occur at or near some of the proposed activities can be found in Section 3 of NSF's *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013* (available at: http://www.nmfs.noaa.gov/pr/pdfs/permits/scripps_westernpacific_ea2013_draft.pdf), which we incorporate here by reference. The limited available data indicate that sea turtles hear airgun sounds and sometimes exhibit localized avoidance. Based on the available data, it is likely that sea turtles would exhibit behavioral changes and/or avoidance within an area of unknown size near a seismic vessel. The two ESA-listed seabird species could occur at or near study sites WP-5 to WP-8 and S-1a and S-1b, but would not occur at sites in Micronesia or in International Waters south of there (i.e., study sites WP-1 to WP-4). No effects are anticipated to the two seabird species from the airgun array during the low-energy seismic survey.

CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES

This chapter of the EA analyzes the impacts of the two alternatives (i.e., whether or not to issue the IHA which includes prescribed means of incidental take, mitigation measures, and monitoring requirements for marine mammals only) and addresses the potential direct, indirect, and cumulative impacts of our issuance of an IHA for Level B harassment take of marine mammals during the seismic survey. The NSF's analyses (i.e., the 2013 *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013*(LGL, 2013) and their 2011 *Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* [NSF, 2011]) and our *Federal Register* notice requesting comments on the proposed IHA (78 FR 33811, June 5, 2013) facilitate an analysis of the direct, indirect, and cumulative effects of our proposed issuance of an IHA.

In developing this EA, NMFS adhered to the procedural requirements of NEPA; the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR 1500-1508), and NOAA's (i.e., NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act) procedures for implementing NEPA.

The following definitions will be used to characterize the nature of the various impacts evaluated with this EA:

- *Short-term or long-term impacts*. These characteristics are determined on a case-by-case basis and do not refer to any rigid time period. In general, short-term impacts are those that would occur only with respect to a particular activity or for a finite period. Long-term impacts are those that are more likely to be persistent and chronic.
- *Direct or indirect impacts*. A direct impact is caused by a proposed action and occurs contemporaneously at or near the location of the action. An indirect impact is caused by a proposed action and might occur later in time or be farther removed in distance but still be a reasonably foreseeable outcome of the action. For example, a direct impact of erosion on a stream might include sediment-laden waters in the vicinity of the action, whereas an indirect impact of the same erosion might lead to lack of spawning and result in lowered reproduction rates of indigenous fish downtstream.
- *Minor, moderate, or major impacts*. These relative terms are used to characterize the magnitude of an impact. Minor impacts are generally those that might be perceptible but, in their context, are not amenable to measurement because of their relatively minor character. Moderate impacts are those that are more perceptible and, typically, more amenable to quantification or measurement. Major impacts are those that, in their context and due to their intensity (severity), have the potential to meet the thresholds for significance set forth in CEQ regulations (40 CFR 1508.27) and, thus, warrant heightened attention and examination for potential means for mitigation to fulfill the requirements of NEPA.
- *Adverse or beneficial impacts*. An adverse impact is one having adverse, unfavorable, or undesirable outcomes on the man-made or natural environment. A beneficial impact is one having positive outcomes on the man-made or natural environment. A single act might result in adverse impacts on one environmental resource and beneficial impacts on another resource.
- *Cumulative impacts*. CEQ regulations implementing NEPA define cumulative impacts as the "impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of

what agency (Federal or non-Federal) or person undertakes such other actions." (40 CFR 1508.7) Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time within a geographic area.

4.1 EFFECTS OF ALTERNATIVE 1 – ISSUANCE OF AN IHA WITH MITIGATION

Alternative 1 is the Preferred Alternative under which we would issue an IHA to SIO for the taking, by Level B harassment, of small numbers of marine mammals, incidental to the conduct of a low-energy seismic survey in international waters and within the EEZs of Micronesia, Papua New Guinea, Indonesia, and the Philippines in the tropical western Pacific Ocean, September through October 2013. We would incorporate the mitigation and monitoring measures and reporting described earlier in this EA into a final IHA.

The NSF's 2013 *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013* (LGL, 2013), their 2011 *Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF, 2011), and our *Federal Register* notice requesting comments on the proposed IHA (78 FR 33811, June 5, 2013) describe, the potential effects of airgun sounds, multibeam echosounder and sub-bottom profiler signals on marine mammals. We incorporate those descriptions by reference and briefly summarize or supplement the relevant sections in the following subchapters.

4.1.1 IMPACTS TO MARINE MAMMAL HABITAT

Our proposed action would have no additive or incremental effect on the physical environment beyond those resulting from the cruise itself and evaluated in the referenced documents.

The effects of one seismic source vessel would not result in substantial damage to ocean and coastal habitats that might constitute marine mammal habitats. The seismic survey will not result in any permanent impact on habitats used by the marine mammals in the survey area, including the food sources they use (i.e., fish and invertebrates), as this impact is temporary and reversible. The main impact associated with the activity will be temporarily elevated noise levels and the associated direct effects on marine mammals. The issuance of an IHA would not affect physical habitat features, such as substrates and water quality. NMFS included a discussion of the potential effects of this action on marine mammal habitats in the notice of the proposed IHA (78 FR 33811, June 5, 2013) and is incorporated here by reference.

4.1.2 IMPACTS TO MARINE MAMMALS

The impacts of the seismic survey on marine mammals are specifically related to acoustic activities. We expect that unavoidable impacts to marine mammals that could be encountered within the survey area would be limited to temporary behavioral responses (such as brief masking of natural sounds) and temporary changes in animal distribution. At most, we interpret these effects on marine mammals as falling within the MMPA definition of Level B (behavioral) harassment for those species managed by us. NMFS included a discussion of the potential effects of this action on marine mammals in the notice of the proposed IHA (78 FR 33811, June 5, 2013) and is incorporated here by reference. This discussion includes the effects of sound from airguns on mysticetes and odontocetes including tolerance, masking, behavioral disturbance, hearing impairment, and other non-auditory physical effects.

Under Alternative 1 – Preferred Alternative, we would authorize the incidental, Level B harassment only, in the form of temporary behavioral disturbance, of several species of cetaceans and expect no long-term or substantial adverse effects on marine mammals, their habitats, or their role in the environment.

SIO proposed a number of monitoring and mitigation measures for marine mammals as part of its IHA application. In analyzing the effects of the preferred alternative, we conclude that the IHA's requirement of the following monitoring and mitigation measures would minimize and/or avoid impacts to marine mammals:

(1) establishment of exclusion zones to avoid injury to marine mammals and visual monitoring of the exclusion zones by Protected Species Observers (PSOs);
(2) shut-down procedures when PSOs detect marine mammals within or about to enter the exclusion zones while the airgun is operating at full volume;
(3) ramp-up procedures; and
(4) speed or course alterations to avoid marine mammals entering the exclusion zone(s).

In SIO's application, they did not request authorization to take marine mammals by Level A harassment because their environmental analyses indicate that marine mammals would not be exposed to levels of sound likely to result in Level A harassment (we refer the reader to Appendix B of the NSF's NEPA document titled, 2011 *Final Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF, 2011). Consequently, SIO's request for take by Level A harassment is zero animals for any species.

We do not anticipate that take by injury (Level A harassment), serious injury, or mortalities would occur and expect that harassment takes should be at the lowest level practicable due to the incorporation of the mitigation measures proposed in SIO's application, nor would we authorize take by injury, serious injury, or mortality.

Survey Timing: We expect the activity to result in limited to temporary behavioral responses (such as brief masking of natural sounds) and temporary changes in animal distribution. There are no known biologically important events (e.g., calving, feeding, etc.) in the survey area during this time.

Acoustic Thresholds: We have determined that for acoustic effects, using acoustic thresholds in combination with corresponding buffer and exclusion zones are an effective way to consistently apply measures to avoid or minimize the impacts of an action. SIO uses the thresholds to establish a mitigation shut-down or exclusion zone for potential acoustic injury and behavioral disturbance (i.e., if an animal is about to enter or enters an area calculated to be ensonified above the level of an established threshold a sound source is shut-down).

Vessel Strikes: The potential for striking marine mammals is a concern with vessel traffic. The probability of a ship strike resulting in an injury or mortality of an animal has been associated with ship speed; it is highly unlikely that the proposed low-energy seismic survey would result in a serious injury or mortality to any marine mammal or sea turtle as a result of vessel strike given the *Revelle's* slow survey speed (approximately 9.3 km/hour (km/hr); 5 knots [kts]). SIO has not requested authorization for take of marine mammals that might occur incidental to vessel ship

strike while transiting to and from the survey site. However, the probability of marine mammal interactions occurring during transit to and from the survey area is unlikely due to the *Revelle's* slow cruising speed which is approximately 22.2 to 23.2 km/hr (12 to 12.5 kts) which is generally below the speed at which studies have noted reported increases of marine mammal injury or death (Laist, Knowlton, Mead, Collet, & Podesta, 2001).

Estimated Take of Marine Mammals by Level B Incidental Harassment: SIO has requested take by Level B harassment as a result of their proposed low-energy marine seismic survey. Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the seismic airgun array are expected to result in the behavioral disturbance of marine mammals.

As mentioned previously, we estimate that 26 species of marine mammals under our jurisdiction could be potentially affected by Level B harassment over the course of the proposed IHA. For each species, these take numbers are small (most estimates are less than one percent) relative to the regional or overall population size. 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 we anticipate that the seismic operations would occur on consecutive days, the estimated duration of the survey would last no more than 26 days. Additionally, the low-energy seismic survey would be increasing sound levels in the marine environment in a relatively small area surrounding the vessel (compared to the range of the animals), which is constantly travelling over distances, and some animals may only be exposed to and harassed by sound for shorter (i.e., less than day).

Table 5 outlines the number of requested Level B harassment takes and the regional population estimates for the marine mammal species that may be taken by Level B harassment that we anticipate as a result of these activities.

Table 5. Estimates of the densities and possible numbers of marine mammal species that might be exposed to sound levels greater than or equal to 160 dB re: 1 µPa during the proposed low-energy seismic survey in the tropical western Pacific Ocean, during September through October 2013.

Species	Density (#/1,000 km^2)[1]	Calculated Take (i.e., Estimated Number of Individuals Exposed to Sound Levels ≥ 160 dB re 1 µPa)[2]	Approximate Percentage of Best Population Estimate of Stock (Calculated Take)[3]	Requested Take Authorization[4]
Mysticetes				
Humpback whale	NA	0	0.03	1
Minke whale	NA	0	0.01	3
Bryde's whale	0.41	0	0.01	2
Omura's whale	NA	0	NA	2
Sei whale	0.29	0	0.03 to 0.02	2
Fin whale	NA	0	0.05 to 0.04	7
Blue whale	NA	0	NA	2
Odontocetes				
Sperm whale	1.23	1	0.02 (<0.01)	5
Pygmy sperm whale	3.19	3	NA (NA)	3
Dwarf sperm whale	10	10	0.09 (0.09)	10
Cuvier's beaked whale	6.8	7	0.04 (0.04)	7
Longman's beaked whale	0.45	0	NA (NA)	18
Ginkgo-toothed beaked whale	0	0	<0.01 (0)	2
Blainville's beaked whale	1.28	1	<0.01 (<0.01)	2
Killer whale	0.16	0	0.08	7
Short-finned pilot whale	320.0	340	0.63 (0.63)	340
False killer whale	1.11	1	0.06 (<0.01)	10
Melon-headed whale	40.0	42	0.09 (0.09)	42
Pygmy killer	0.14	0	0.02 (0)	6

whale				
Risso's dolphin	30.0	32	0.04 (0.04)	32
Bottlenose dolphin	110.0	118	0.07 (0.07)	118
Rough-toothed dolphin	0.29	0	0.01 (0)	9
Fraser's dolphin	580.0	617	0.21 (0.21)	617
Striped dolphin	6.16	7	<0.01 (<0.01)	27
Pantropical spotted dolphin	650.0	692	0.16 (0.16)	692
Spinner dolphin	1,370.0	1,458	0.2 (0.2)	1,458

NA = Not available or not assessed.

[1] Densities calculated from Table 4 of Barlow (2006) using the abundance in the outer EEZ stratum and the surface area of the stratum give on p. 452 of Barlow (2006).

[2] Calculated take is estimated density (reported density times correction factor) multiplied by the area ensonified to 160 dB (rms) around the planned seismic lines, increased by 25% for contingency.

[3] Requested (and calculated) takes expressed as percentages of the regional populations.

[4] Requested Take Authorization increased to mean group size for species for which densities were not available but that have been sighted in the survey area and for species whose calculated takes were less than group size.

We do not expect the activity to impact rates of recruitment or survival for any affected species or stock. The seismic surveys would not take place in areas of significance for marine mammal feeding, resting, breeding, or calving and would not adversely impact marine mammal habitat.

4.2 EFFECTS OF ALTERNATIVE 2– NO ACTION ALTERNATIVE

Under the No Action Alternative, we would not issue an IHA to SIO for the taking, by Level B harassment, of small numbers of marine mammals, incidental to the conduct of a low-energy seismic survey in international waters and within the EEZs of Micronesia, Papua New Guinea, Indonesia, and the Philippines in the tropical western Pacific Ocean, September through October 2013. As a result, SIO would not receive an exemption from the MMPA. For the purposes of this EA, NMFS assumes under the No Action Alternative that SIO would conduct the proposed low-energy seismic survey without an exemption from the MMPA against the take of marine mammals. NMFS also assumes that SIO will conduct the low-energy seismic survey in the absence of the protective monitoring and mitigation measures for marine mammals that would be required by the IHA.

4.2.1 IMPACTS TO MARINE MAMMALS

Under the No Action alternative, the cruise would likely result in additional impacts to marine mammals, specifically related to acoustic activities, compared to the Proposed Action, due to the absence of mitigation and monitoring measures required under the IHA.

If the survey proceeded without the protective monitoring and mitigation measures and reporting requirements required by a final IHA under the MMPA and ESA, the direct, indirect, or cumulative effects on marine mammals of not issuing the IHA would include the following:

- Marine mammals that could be encountered within the survey area could experience acoustic injury, temporary behavioral responses (such as brief masking of natural sounds), and temporary changes in animal distribution because of the lack mitigation measures required in the IHA;
- Incidental take of marine mammals would likely occur at levels we have already identified and evaluated in our *Federal Register* notice on the proposed IHA (78 FR 33811, June 5, 2013) (see Table 5 [above] for the estimated number of individuals and takes authorized by marine mammal species). The *Federal Register* notice on the proposed IHA (78 FR 33811, June 5, 2013) has a description of the potential effects on marine mammals from the acoustic stimuli that includes one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, temporary or permanent hearing impairment, or non-auditory physical or physiological effects; and
- NMFS would not be able to obtain the monitoring and reporting data needed to assess the anticipated impact of the activity upon the species or stock of marine mammals; assess the anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses; and comply with the MMPA's requirement to increase the knowledge of the species.

4.3 COMPLIANCE WITH NECESSARY LAWS – NECESSARY FEDERAL PERMITS

We have determined that the issuance of an IHA is consistent with the applicable requirements of the MMPA, ESA, and our regulations.

Under section 7 of the ESA, the NSF initiated formal consultation with the NMFS, Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on this seismic survey. Likewise, we have also conducted a concurrent formal consultation with the Office of Protected Resources, Endangered Species Act Interagency Cooperation Division.

The formal consultation under section 7 of the ESA concluded with a single Biological Opinion for the NSF's Division of Ocean Sciences and to the NMFS's Office of Protected Resources, Permits and Conservation Division. All parties must comply with the relevant terms and conditions of the ITS corresponding to the Biological Opinion issued to the NSF, SIO, and to us. SIO must comply with the mitigation and monitoring requirements included in the IHA in order to be exempted from prohibition on take of listed endangered marine mammal species otherwise prohibited by section 9 of the ESA.

4.4 UNAVOIDABLE ADVERSE IMPACTS

The NSF's 2013 *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013* (LGL, 2013), their 2011 *Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF, 2011), and our *Federal Register* notice requesting comments on the proposed IHA (78 FR 33811, June 5, 2013) summarize unavoidable adverse impacts to marine mammals or the populations to which they belong or on their habitats occurring in the survey area. We incorporate those documents by reference.

We acknowledge that the incidental take authorized by the IHA would potentially result in unavoidable adverse impacts. However, we do not expect SIO's activities to have adverse consequences on the viability of marine mammals in the study area and we do not expect the marine mammal populations in that area to experience reductions in reproduction, numbers, or distribution that might appreciably reduce their likelihood of surviving and recovering in the wild. Numbers of individuals of all species taken by harassment are expected to be small (relative to species or stock abundance), and the seismic survey would have a negligible impact on the affected species or stocks of marine mammals.

4.5 CUMULATIVE EFFECTS

Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR§1508.7). Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time (e.g., in the tropical western Pacific Ocean for 26 days).

Impacts to marine mammal populations include the following: past, present, and reasonably foreseeable future commercial whaling; altered prey base and habitat quality as a result of global climate change; past, present, and reasonably foreseeable future predation, exposure to biotoxins and the resulting bioburden; past and future research activities in the area; vessel noise and collisions; and commercial fisheries. These activities account for cumulative impacts to regional and worldwide populations of marine mammals, many of whom are a small fraction of their former abundance and are listed as endangered or threatened under the ESA and depleted under the MMPA.

Marine mammal experts now consider acoustic masking from anthropogenic noise as a major threat to marine mammal populations, particularly low-frequency specialists such as baleen whales. Low-frequency ocean noise has increased in recent decades, often in habitats with seasonally resident populations of marine mammals, raising concerns that noise chronically influences life histories of individuals and populations (Clark *et al*., 2009). However, quantifying the biological costs for marine mammals within an ecological framework is a critical missing link to our assessment of

cumulative noise impacts in the marine environment and assessing cumulative effects on marine mammals (Clark *et al*., 2009).

The proposed low-energy seismic survey would add another, albeit temporary activity to the marine environment in the Pacific Ocean and the proposed low-energy seismic survey would be limited to a small area on the tropical western Pacific Ocean for a relatively short period of time.

The NSF's 2013 *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September–October 2013* (LGL, 2013) summarizes the potential cumulative effects to marine mammals or the populations to which they belong or on their habitats occurring in the survey area. Our analyses, which incorporate their analyses by reference and briefly summarize them here, focus on the activities that are most likely to impact the marine mammals found in the proposed survey area (i.e., research activities, vessel traffic, and commercial fisheries).

4.5.1 Past, Present, and Reasonably Foreseeable Future Seismic Surveys in the Tropical Western Pacific Ocean

Low-energy seismic profiles using a single 40 in^3 airgun were collected across Site WP-1 in 1977 and across Sites WP and WP-4 in 1967. Low-energy seismic profiles using a single 45 in^3 GI airgun were also collected across and near Sites S1-a and S1-b in 1999. The proposed surveys by the *Revelle* would provide data to be included in a separate proposal submitted to the IODP for funding consideration to collect drill core samples to extend the record of millennial climate variability of the western equatorial Pacific Ocean to the mid-Miocene. A 2D seismic characterization is required to determine the viability of future drilling at the sites. A Programmatic Environmental Impact Statement was prepared for IODP-USIO drilling activities (IODP-USIO, 2008) and an NSF Record of Decision was issued (NSF, 2008). Should IODP consider funding a future proposal, it would evaluate if any additional environmental analysis were warranted. Other scientific research activities have been and may be conducted in this region in the future, however no other marine geophysical surveys are proposed using the *Revelle* in the foreseeable future.

At the present time, the action proponents are not aware of other research activities planned to occur in the proposed survey area during the September to October 2013 timeframe, but research activities planned by other entities are possible, although unlikely.

There are no other seismic surveys with an IHA from us scheduled to occur in international waters and within the EEZs of Micronesia, Papua New Guinea, Indonesia, and the Philippines in the tropical western Pacific Ocean, September through October 2013. Therefore, we are unaware of any synergistic impacts to marine resources associated with reasonably foreseeable future actions that may be planned or occur within the same region of influence. The impacts of conducting the low-energy seismic survey on marine mammals are specifically related to acoustic activities, and these are expected to be temporary in nature, negligible, and would not result in substantial impacts to marine mammals or to their role in the ecosystem. We do not expect that the issuance of an IHA would have a significant cumulative effect on the human environment, due to the required mitigation and monitoring measures described in Section 2.3.1

4.5.2 Vessel Traffic, Vessel Noise, and Collisions

Vessel traffic and around the proposed seismic sites WP-1 to WP-4 in the Micronesia EEZ and in International Waters would consist of commercial shipping and commercial fishing vessels. These sites are in the general vicinity of a relatively common shipping route between Papua New Guinea and the Orient. Based on data made available through the Automated Mutual-Assistance Vessel Recue (AMVER) system managed by the U.S. Coast Guard (USCG), up to 14 commercial vessels per month passed near the proposed survey sites during 2007 to 2012 (USCG, 2012). An examination of total vessel traffic in the Pacific Islands region from 2003 similarly indicated a frequency of 100 to 200 vessels/year around the proposed seismic sites (Anderson *et a*l., 2003 in Kinch *et al*., 2010).

Vessel traffic around the proposed seismic sites in the Papua New Guinea EEZ would be similar to that of the Micronesia EEZ, including commercial shipping and commercial fishery vessels. The northern coastal region is a common shipping area, and sites WP-5 and WP-6 in particular are situated along shipping routes in the region between Papua New Guinea and the Orient. Analysis of the AMVER system indicated that up to 14 vessels/month passed by the sites during 2007 to 2012, with the exceptions of August 2008, June 2009, and July and August 2010, when 15 to 49 vessels/month were noted (USCG, 2012). Anderson *et al*. (2003 in Kinch *et al*., 2010) similarly noted shipping traffic upwards of 200 vessels per year near the proposed seismic sites in 2003.

There is relatively little commercial vessel traffic in the area around WP-7 in the Indonesia EEZ. It is likely that commercial and artisanal fishery vessels comprise the majority of vessel traffic in the area. The AMVER system indicated that less than 4 vessels/month passed by the proposed seismic site during 2007 to 2012, with the exception of May 2011 during which up to 14 vessels were in the area (USCG, 2012). Total vessel traffic was noted at 100 to 200 vessels/year in the general area in 2003 (Anderson *et al*., 2003 in Kinch *et al*., 2010).

The proposed seismic site WP-8 is situated in a somewhat common shipping route along the southeastern region of the Philippines, where traffic would consist of both commercial shipping and commercial fishery vessels. Examination of the AMVER system indicated that 5 to 14 commercial vessels per month passed near the site WP-8 during 2007 to 2012, with the exception of July 2011, which 15 to 49 commercial vessels passed through the area (USCG, 2012). As of 2007, 89 commercial fishing operators and 269 commercial fishing vessels have been known to operate out of management Region XI, nearest to site WP-8 (BFAR Regulatory and Quarantine Division in BFAR, 2010).

The total transit distance (approximately 8,050 km [4,346.7 nmi]) by SIO's *Revelle* would be minimal relative to total transit length for vessels operating in the proposed survey area during September to October. We expect that the impacts of the of the *Revelle's* operations combined with the existing shipping operations to produce an insignificant overall ship disturbance effects on marine mammals.

4.5.3 FISHING

NSF's 2013 *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September-October 2013* (LGL, 2013) describes commercial fisheries operations in the general area of the proposed survey (Chapter 3). The primary contributions of fishing to potential cumulative impacts on marine mammals involve direct removal of prey items, noise, potential entanglement and the direct and indirect

removal of prey items. However, fishing operations at most of the proposed survey sites likely would be limited because of distance from shore. There may be some localized avoidance by marine mammals of fishing vessels near the proposed low-energy seismic survey area. SIO's operations in the proposed survey area are also limited temporally (duration of 26 days), and we expect that the combination of the *Revelle*'s operations with the existing commercial fishing operations to produce an insignificant overall disturbance effect on marine mammals. Proposed survey operations should not impede commercial fishing operations and the Revelle would avoid fishing vessels when towing seismic equipment.

CHAPTER 5 – LIST OF PREPARERS AND AGENCIES CONSULTED

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CHAPTER 6 – REFERENCES

Clark, C. W., Ellison, W. T., Southall, B. L., Hatch, L., Van Parijs, S. M., Frankel, A., *et al*. (2009). Acoustic masking in marine ecosystems: intuitions, analysis, and implication. *Marine Ecology Progress Series, 395*, 201-222, available at: http://www.int-res.com/articles/theme/m395p201.pdf (last visited July 31, 2013).

Greene, C. R., Jr. (1997). *Physical acoustics measurements. p. 3-1 to 3-63 in W.J. Richardson (ed.) Northstar Marine Mammal Monitoring Program, 1996: Marine mammal and acoustical monitoring of a seismic program in the Alaskan Beaufort Sea. LGL Rep. 2121-2.* LGL Ltd., King City, Ont., and Greeneridge Sciences Inc., Santa Barbara, CA: LGL Limited, Environmental Research Associates, available at: http://www.arlis.org/docs/vol2/point_thomson/1102/1102A_%20northstar%20marine%20mammal%20monitoring%20program,1996_.pdf (last visited July 31, 2013).

Laist, D. W., Knowlton, A. R., Mead, J. G., Collet, A. S., & Podesta, M. (2001). Collisions between ships and whales. *Marine Mammal Science, 17*(1), 35-75, available at: http://mmc.gov/articles/pdf/shipstrike.pdf (last visited July 31, 2013).

LGL. (2013). (LGL Ltd., Environmental Research Associates). *Environmental Analysis of a Low-Energy Marine Geophysical Survey by the R/V Roger Revelle in the Tropical Western Pacific Ocean, September-October 2013*. LGL Report TA8268-1. Rep. from LGL Ltd., King City, Ont., for Scripps Institution of Oceanography, La Jolla, CA, and National Science Foundation, Arlington, VA., 54 pp, available at: http://www.nmfs.noaa.gov/pr/pdfs/permits/scripps_westernpacific_ea2013_draft.pdf (last visited July 31, 2013).

NMFS. (2013). (National Marine Fisheries Service). Takes of Marine Mammals Incidental to Specified Activities; Low-Energy Marine Geophysical Survey in the Tropical Western Pacific Ocean, September to October 2013. Notice; proposed incidental harassment authorization; request for comments. ***Federal Register.*** *78(June 5, 2013):33811-33836*, available at: http://www.gpo.gov/fdsys/pkg/FR-2013-06-05/pdf/2013-13289.pdf (last visited July 31, 2013).

NSF. (2011). (National Science Foundation). *Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey*. 801 pp, available at: http://www.nsf.gov/geo/oce/envcomp/usgs-nsf-marine-seismic-research/nsf-usgs-final-eis-oeis_3june2011.pdf (last visited July 31, 2013).

Wyrtki, K. (1989). Some Thoughts about the West Pacific Warm Pool. in J. Picaut, *et al*. Eds. *Proceedings of Western Pacific International Meeting and Workshop on TOGA COARE*. 99-109 pp, available at: ftp://mana.soest.hawaii.edu/pub/rlukas/Klaus/papers/Wyrtki%201989%20TOGA%20COARE%20warm%20pool.pdf