ENVIRONMENTAL ASSESSMENT

Issuance of an Incidental Harassment Authorization to the Lamont-Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the Northwest Pacific Ocean, March through May, 2012

March 2012

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LOCATION: An area bounded by 33.5–36° North by 156–161° East, 1,200 kilometers offshore of the east coast of Japan in the northwest Pacific Ocean.

ABSTRACT: This Environmental Assessment analyzes the environmental impacts of the National Marine Fisheries Service's proposal to issue an Incidental Harassment Authorization to the Lamont-Doherty Earth Observatory for the taking, by Level B harassment, of small numbers of marine mammals, incidental to conducting a marine geophysical (seismic) survey in the northwest Pacific Ocean, March through May, 2012.

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LIST OF ACRONYMS, ABBREVIATIONS, AND INITIALISMS

2-D	two dimensional
ARF	Academic Research Fleet
BiOp	Biological Opinion
CEQ	President's Council on Environmental Quality
CFR	Code of Federal Regulations
Commission	The Marine Mammal Commission
CPA	closest point of approach
dB	decibel
°	degree
E	east
EA	Environmental Assessment
EIS	Environmental Impact Statement
E.O.	Executive Order
ESA	Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.)
FONSI	Finding of No Significant Impact
Foundation	National Science Foundation
FR	*Federal Register*
hrs	hours
Hz	hertz
IHA	Incidental Harassment Authorization
ITS	Incidental Take Statement
KE	Kuroshio Extension
kHz	kilohertz
km	kilometer
kts	knots
kW	kilowatt
Langseth	R/V *Marcus G. Langseth*
L-DEO	Lamont-Doherty Earth Observatory
LGL	LGL Limited, environmental research associates
m	meter
mi	mile
mph	miles per hour
MMPA	Mammal Protection Act of 1972, as amended (16 U.S.C. 1631 *et seq*.)
ms	millisecond
n	number
N	north
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq*.)
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NOR	Notice of Receipt
NSF	National Science Foundation
OMB	Office of Management and Budget
PSVO	Protected Species Visual Observer
s	second
Secretary	Secretary of Commerce
§	section
t	ton
U.S.C.	United States Code
W	west
WCPFC	Western and Central Pacific Fisheries Commission

1. CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 DESCRIPTION OF ACTION

NMFS has received an application from Lamont-Doherty Earth Observatory (L-DEO), a part of Columbia University, for an Incidental Harassment Authorization (IHA) to take marine mammals, by harassment, incidental to conducting a marine geophysical (seismic) survey in the northwest Pacific Ocean in international waters, March through May, 2012. L-DEO's seismic survey activities, which have the potential to cause marine mammals to be behaviorally disturbed, warrant an incidental take authorization from NMFS under section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1631 *et seq*.).

The proposed action considered in this Environmental Assessment (EA) is the issuance of an IHA, by NMFS, for the incidental taking, by Level B harassment only, of small numbers of marine mammals, incidental to the conduct of L-DEO's seismic survey from March through May, 2012 (which includes a three-week buffer for operational delays), pursuant to section 101(a)(5)(D) of the MMPA.

This EA, titled "*Issuance of an Incidental Harassment Authorization to the Lamont-Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the Northwest Pacific Ocean March - May, 2012*" (hereinafter, EA), addresses the impacts on the human environment that would result from issuance of this IHA for MMPA Level B harassment of marine mammals during the L-DEO survey under the required mitigation and monitoring measures that would be specified in the authorization.

1.1.1 BACKGROUND

The National Science Foundation (NSF; Foundation) 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 Foundation 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.

NSF also invests in research infrastructure, including the Academic Research Fleet (ARF) which allows NSF-funded scientists to conduct marine research in coastal and open waters. These funds support ship operations; shipboard scientific support equipment; oceanographic instrumentation and technical services; and submersible support. NSF owns the R/V *Marcus G. Langseth* (*Langseth*), a 235-foot (71.6 meter- (m)) research vessel that L-DEO, a part of Columbia University, operates under a cooperative agreement with the Foundation.

In 2009, an NSF-expert panel recommended a collaborative research proposal titled, "*Collaborative Research: Geophysical constraints on Mechanisms of Ocean Plateau Formation from Shatsky Rise, Northwest Pacific*" (NSF Awards #0927001; 0926945; and 0926611) for funding and ship time on the *Langseth*. As the federal action agency, the NSF has funded L-DEO's proposed seismic survey in the northwest Pacific Ocean as a part of the NSF Act.

L-DEO's seismic survey activities—which have the potential to cause marine mammals to be behaviorally disturbed—warrant an incidental take authorization from NMFS under section

101(a)(5)(D) of the MMPA. Marine mammals under NMFS' jurisdiction that could be adversely affected by the proposed seismic survey are:

Mysticetes

- Blue whale (*Balaenoptera musculus*)
- Bryde's whale (*B. edeni/brydei*)
- Fin whale (*B. physalus*)
- Humpback whale (*Megaptera novaeangliae*)
- North Pacific right whale (*Eschrichtius robustus*)
- Minke whale (*B. acutorostrata*)
- Sei whale (*B. borealis*)

Odontocetes

- Baird's beaked whale (*Berardius bairdii*)
- Blainville's beaked whale (*Mesoplodon densirostris*)
- Common bottlenose dolphin (*Tursiops truncatus*)
- Cuvier's beaked whale (*Ziphius cavirostris*)
- Dall's porpoise (*Phocoenoides dalli*)
- Dwarf sperm whale (*Kogia sima*)
- False killer whale (*Pseudorca crassidens*)
- Fraser's dolphin (*Lagenodelphis hosei*)
- Ginkgo-toothed beaked whale (*M. ginkgodens*)
- Hubb's beaked whale (*M. carlhubbsi*)
- Longman's beaked whale (*Indopacetus pacificus*)
- Killer whale (*Orcinus orca*)
- Melon-headed whale (*Peponocephala electra*)
- Northern right whale dolphin (*Lissodelphis borealis*)
- Pacific white-sided dolphin (*L. obliquidens*)
- Pantropical spotted dolphin (*Stenella attenuata*)
- Pygmy killer whale (*Feresa attenuata*)
- Pygmy sperm whale (*K. breviceps*)
- Risso's dolphin (*Grampus griseus*)
- Rough-toothed dolphin (*Steno bredanensis*)
- Short-beaked common dolphin (*Delphinus delphis*)
- Short-finned pilot whale (*Globicephala macrorhynchus*)
- Sperm whale (*Physeter macrocephalus*)
- Spinner dolphin (*S. longirostris*)
- Stejneger's beaked whale (*M. stejnegeri*)
- Striped dolphin (*S. coeruleoalba*)

Pinnipeds

- Northern fur seal (*Callorhinus ursinus*)

Accordingly, L-DEO submitted an application on October 31, 2011 to NMFS' Office of Protected Resources requesting NMFS to issue an IHA for the take, by Level B harassment only, of small numbers of marine mammals, incidental to conducting a proposed seismic survey in the northwest Pacific. L–DEO received an IHA in 2010 to conduct the same activity in the same location. However, due to medical emergencies, L–DEO suspended its operations and was unable to complete the seismic survey.

L–DEO's proposed seismic survey on the Shatsky Rise is scheduled to commence on March 24, 2012 and end on April 16, 2012. 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, NMFS proposes to issue an authorization that is effective from March 24, 2012 to May 7, 2012.

The NSF actions of funding Awards #0927001; 0926945; and 0926611 and NMFS' action of issuing an IHA to L-DEO that authorizes incidental takes, Level B harassment only, of small numbers of marine mammals, incidental to the conduct of the seismic survey are interrelated actions.

1.1.2 Incorporation of NSF's Analysis and Report by Reference

After conducting an independent review of the information and analyses for sufficiency and adequacy, NMFS incorporates by reference the NSF's Final National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) Analysis Pursuant To Executive Order (E.O.) 12114 titled, Marine Seismic Survey on the Shatsky Rise in the Northwest Pacific Ocean, March –

April, 2012 (NSF, 2012) (hereinafter, the NSF NEPA Analysis) and an associated report prepared by LGL Limited, environmental research associates (LGL) for NSF, titled "*Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth on the Shatsky Rise in the Northwest Pacific Ocean, March–April 2012*," (LGL, 2012), (hereinafter, the NSF/L-DEO Report) pursuant to 40 CFR 1502.21 and NOAA Administrative Order (NAO) 216-6 § 5.09(d). In summary, the NSF NEPA Analysis and the NSF/L-DEO Report concluded that with incorporation of the proposed monitoring and mitigation measures, the potential impacts of the proposed action to marine mammals, sea turtles, seabirds, fish and invertebrates would be limited to short-term, localized changes in behavior and distribution near the seismic vessel.

1.1.3 MMPA PURPOSE AND NEED

The MMPA and the 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(b)(4) of the ESA.

Section 101(a)(5)(D) of the MMPA directs the Secretary of Commerce 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 certain findings are made and a notice of a proposed authorization is provided to the public for review. Section 101(a)(5)(D) of the MMPA also establishes a 45-day time limit for NMFS' review of an application for an IHA followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. Within 45 days of the close of the public comment period, NMFS must either issue or deny the IHA.

Purpose: The primary purpose of NMFS issuing an IHA to L-DEO is to provide an exception to L-DEO from the take prohibitions for marine mammals under the MMPA, incidental to the conduct of L-DEO's seismic survey from March through May, 2012. An ancillary purpose of issuing an IHA to L-DEO is to regulate the incidental take of marine mammals associated with the conduct of the seismic survey from March through May, 2012.

Need: As noted, the MMPA establishes a general moratorium or prohibition on the take of marine mammals, including take by behavioral harassment. The MMPA establishes a process by which individuals engaged in specified activities within a specified geographic area may request an IHA. NMFS must authorize the take of small numbers of marine mammals if, among other things, it complies with the process described above this section, makes certain determinations, and requires the implementation of mitigation and monitoring to minimize potential adverse impacts and resulting take. Specifically, NMFS shall grant the IHA if it finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (*where relevant*). The IHA must set forth, where appropriate, the permissible methods of taking, other means of effecting the least practicable adverse impact on the species or stock and its habitat, and requirements pertaining to the mitigation, monitoring and reporting of such takings.
L-DEO has submitted a complete application demonstrating potential eligibility for issuance of an IHA. NMFS now has a corresponding duty to determine whether and how it can fashion an IHA authorizing take by harassment incidental to the activities described in L-DEO's

application. The need for this action is therefore established and framed by the MMPA and NMFS's responsibilities under Section 101(a)(5)(D) of that Act, its implementing regulations, and other applicable requirements which will influence NMFS' decision making, such as section 7 of the Endangered Species Act which is discussed in more detail below this section. The foregoing purpose and need guide NMFS in developing alternatives for consideration, including alternative means of mitigating potential adverse effects.

1.2 NEPA REQUIREMENTS AND SCOPE OF NEPA ANALYSIS

This EA focuses primarily on the environmental effects of authorizing MMPA Level B harassment of marine mammals during seismic surveys in the northwest Pacific Ocean. The MMPA and its implementing regulations (50 CFR § 216.104) require that upon receipt of a valid and complete application for an IHA, NMFS must publish a notice of proposed IHA in the *Federal Register* (FR). The notice issued for the L-DEO action summarizes the purpose of the requested IHA, includes a statement that NMFS would prepare an EA for the proposed action, and invited interested parties to submit written comments concerning the application and NMFS' preliminary analyses and findings including those relevant to consideration in the EA.

NOAA Administrative order NAO 216-6 established agency procedures for complying with NEPA and the implementing NEPA regulations issued by the President's Council on Environmental Quality (CEQ). Consistent with the intent of NEPA and the clear direction in NAO 216-6 to involve the public in NEPA decision-making, NMFS structures the decision-making process for issuance of IHAs to provide for public participation in the NEPA process by requesting comments on potential environmental impacts described in the proposed IHA, and, in this case, the NEPA documents prepared by NSF and LGL.

Under the requirements of NAO 216-6, the proposed issuance of authorization for incidental take of marine mammals is an action that is not categorically excluded from NEPA review. In addition, it is not the type of action normally requiring preparation of an Environmental Impact Statement (EIS). Therefore, NMFS has prepared this EA to assist in determining whether the direct, indirect and cumulative impacts related to its issuance of an IHA under the MMPA for 30 marine mammal species are likely to result in significant impacts to the human environment, or whether the analysis, contained herein, including documents referenced and incorporated by reference and public comments received, supports the issuance of a Finding of No Significant Impact (FONSI).

1.2.1 ISSUES WITHIN THE SCOPE OF THIS EA

Given the limited scope of the decision for which NMFS is responsible (*i.e.* whether or not to issue the authorization including prescribed means of take, mitigation measures and monitoring requirements) that this EA is intended to inform, the scope of analysis is limited to evaluating and disclosing the impacts to living marine resources and their habitat likely to be affected by the L-DEO seismic surveys. As described more fully later in this document, the EA identifies all marine mammals, and species protected under the ESA, that are likely to occur within the action area.

The primary analysis focuses on the impacts to certain marine mammal and sea turtle species likely to result from the proposed L-DEO seismic survey in the northwest Pacific Ocean in March, April, and May; impacts that would result from the alternatives presented; and the consideration of potential cumulative environmental impacts. Impacts to other marine species

and habitat located in the action area were considered unlikely, and, thus received less detailed evaluation.

The need for this EA is to provide a NEPA analysis of potential environmental impacts to inform the decision of whether or not to issue the IHA to L-DEO and to determine whether the L-DEO proposed action has any potential significant impacts. NOAA has relied on and incorporated the more comprehensive environmental analysis prepared for the NSF (LGL, 2012) addressing the direct, indirect and cumulative impacts of the underlying activities associated with the seismic cruise described in the application and its supporting documents.

1.2.2 NEPA SCOPING SUMMARY

In order to identify environmental issues and impacts to be addressed in this EA, NMFS undertook several scoping steps.

- NMFS independently evaluated and determined the sufficiency of the scope of the NSF NEPA Analysis and NSF/L-DEO Report and has incorporated those documents by reference (see Section 1.1.2).
- NMFS also made available the NSF NEPA Analysis and NSF/L-DEO Report to the public at (http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications) concurrently with the release of the *Federal Register* (FR) notice requesting comments on the proposed IHA (77 FR 4765, January 31, 2012).

In addition, the NSF also made available the NSF NEPA Analysis and NSF/L-DEO Report on the agency's website (http://www.nsf.gov/geo/oce/envcomp/index.jsp) for a 30-day public comment period that ended on November 9, 2011.

As noted in Section 1.2, the *Federal Register* notice of receipt of an MMPA IHA application and corresponding public comment period are instrumental in providing the public with information on relevant environmental issues and by offering the public a meaningful opportunity to provide comments to NMFS for consideration in the MMPA and NEPA decision-making processes.

1.2.3 COMMENTS ON NSF'S NEPA ANALYSIS AND REPORT

The Marine Mammal Commission (Commission) provides comments on all proposed IHAs as part of their established role under the MMPA (§ 202 (a)(2), *humane means of taking marine mammals*). No other organizations or private citizens submitted comments on the NSF NEPA Analysis or the NSF/L-DEO Report to date. NMFS has evaluated all comments and did not identify any comments: (1) that raised substantial questions as to whether the project may cause significant degradation to any marine mammal species or its habitat; or (2) that established a substantial dispute concerning the survey's size, nature, or effect.

The Commission's comments are briefly summarized here. Generally, the Commission recommended that NMFS:

- require the applicant to take in-situ measurements at the survey location to verify, refine, and if needed, recalculate safety zone estimates;
- condition the IHA to prohibit an 8-minute pause and require a longer pause before ramping-up after a power-down or shut-down of the airguns, based on the presence of a mysticete or large odontocete in the exclusion zone and the *Langseth's* movement (speed and direction);

- extend the required monitoring period to at least one hour before firing the airguns;
- extend the monitoring period to at least one hour before resuming airgun activities after a power-down due to a marine mammal sighting within the exclusion zone;
- provide additional justification for its preliminary determination that the planned visual and acoustic monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion zones; and
- extend the required monitoring period at start-up to at least one hour before the initiation of seismic activities and one hour before the resumption of airgun activities after a power-down because of a marine mammal sighting within the safety zone.

NMFS has considered the comments regarding additional mitigation measures within the context of the MMPA requirement to effect the least practicable adverse effect to marine mammals and their habitats. NMFS has developed responses to specific comments and will provide those responses in the *Federal Register* notice if NMFS decides to issue the IHA. NMFS does not repeat those responses here. NMFS notes, however, that it fully considered the Commission's comments, particularly those related to mitigation and monitoring. Based on those comments, NMFS has re-evaluated the mitigation and monitoring proposed for incorporation in the IHA and has determined, based on the best available data, that the mitigation measures proposed by the applicant are the most feasible and effective mitigation measures to achieve the MMPA requirement of effecting the least practicable impact on each species or stock.

1.2.4 OTHER EAS THAT INFLUENCE THE SCOPE OF THIS EA

In February 2010, NMFS received an application from L-DEO requesting NMFS to issue an IHA for the take, by Level B harassment only, of small numbers of marine mammals incidental to a seismic survey at the Shatsky Rise from July through September, 2010. In July 2010, NMFS prepared an EA (NMFS, 2010b) titled *"Issuance of an Incidental Harassment Authorization to the Lamont-Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey on the Shatsky Rise in the Northwest Pacific Ocean, July-September 2010."* NMFS' 2010 EA incorporated the NSF's Environmental Analysis Pursuant To Executive Order 12114 (NSF, 2010a) and an associated report (Report) prepared by LGL Limited Environmental Research Associates (LGL) for NSF, titled, "Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth on the Shatsky Rise in the Northwest Pacific Ocean, July – September, 2010, (LGL, 2010)" by reference. NMFS' 2010 EA analyzed the direct, indirect and cumulative environmental impacts of the specified activities on marine mammals including those listed as threatened or endangered under the ESA. After completion of the 2010 EA, NMFS made a Finding of No Significant Impact (FONSI) and issued an IHA in July 2010 to L-DEO for the seismic survey.

This EA updates information contained in the previous EA and includes new information on the potential impacts to marine mammals based on previous monitoring that occurred during the 2010 seismic survey activities.

1.3 APPLICABLE LAWS AND NECESSARY FEDERAL PERMITS

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

1.3.1 THE NATIONAL ENVIRONMENTAL POLICY ACT

NEPA's EIS requirement is applicable to 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. NMFS' issuance of an IHA for incidental harassment of marine mammals represents approval and regulation of takes of marine mammals incidental to the applicant's activities and is potentially a major Federal action for which NEPA review is required. While NEPA does not dictate a substantive outcome for a proposed IHA, it requires consideration of environmental issues in federal agency planning and decision making, and requires an analysis of alternatives and analysis of direct, indirect, and cumulative environmental effects of the NMFS' proposed action to authorize MMPA Level B incidental take. As noted, NMFS has prepared this EA to analyze environmental impacts and to assist in determining whether an EIS is necessary for the action.

1.3.2 THE ENDANGERED SPECIES ACT

Section 7 of the ESA requires consultation with the appropriate federal agency (either NMFS or the U.S. Fish and Wildlife Service) for federal actions that "may affect" a listed species or critical habitat. NMFS' issuance of an IHA affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these section 7 consultation requirements. Accordingly, NMFS is required to insure that its action is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of critical habitat for such species. Regulations specify the requirements for these consultations (50 CFR § 402).

NMFS has determined that issuance of the IHA is likely to result in adverse effects to listed marine mammal species and, therefore, in March, 2012 NMFS completed a formal section 7 consultation and prepared a Biological Opinion (BiOp) to consider whether or not the action is likely to jeopardize such species or result in the adverse modification or destruction of critical habitat designated for such species, if applicable.

1.3.3 THE MARINE MAMMAL PROTECTION ACT

Section 101(a)(5)(D) of the MMPA directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking by harassment of small numbers of marine mammals of a species or population stock, for periods of not more than one year, by United States citizens who engage in a specified activity (other than commercial fishing) within a specific geographic region if certain findings are made and a *Federal Register* notice of a proposed authorization is provided to the public for review.

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the United States can apply for an authorization to incidentally take small numbers of marine mammals by harassment. Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as:

> any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild ["Level A harassment"]; or (ii) has the

> potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [“Level B harassment”].

Section 101(a)(5)(D) of the MMPA establishes a 45-day time limit for NMFS’ review of an application followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. Not later than 45 days after the close of the public comment period, if the Secretary makes the findings set forth in Section 101(a)(5)(D)(i) of the MMPA, the Secretary shall issue the authorization with appropriate conditions to meet the requirements of clause 101(a)(5)(D)(ii) of the MMPA.

NMFS has promulgated regulations to implement the permit provisions of the MMPA (50 CFR Part 216) and has 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.

1.3.4 Executive Order 12114 – Environmental Effects Abroad of Major Federal Actions

The requirements for Executive Order (E.O.) 12114, discussed in the NSF/L-DEO Report (LGL, 2012) and NSF’s EA (NSF, 2012) are incorporated herein, by reference. 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, NMFS is required to be informed of environmental considerations and take those considerations into account when making decisions on major federal actions which could have environmental impacts anywhere beyond the borders of the United States.

2. CHAPTER 2 – ALTERNATIVES INCLUDING THE PROPOSED ACTION

The NEPA implementing regulations (40 CFR § 1502.14) and NAO 216-6 provide guidance on the consideration of alternatives to a federal proposed action and require rigorous exploration and objective evaluation of all reasonable alternatives. Each alternative must be feasible and reasonable in accordance with the President's CEQ regulations (40 CFR §§ 1500-1508) and the purpose and need of the agency proposed action. This chapter describes the range of potential actions (alternatives) determined reasonable with respect to achieving the stated purpose and need, as well as alternatives eliminated from detailed study and also summarizes the expected outputs and any related mitigation of each alternative.

This EA evaluates the alternatives to ensure that they would fulfill the purpose and need, namely: (1) the issuance of an IHA for the take of marine mammals by level B behavioral harassment, incidental to L-DEO's conduct of a proposed marine geophysical survey in the northwest Pacific Ocean from March 24 through May 7, 2012; and (2) compliance with the MMPA which sets forth specific standards (*i.e*., unmitigable adverse impact, negligible impact, monitoring and reporting) that must be met in order for NMFS to issue an IHA.

NMFS' Proposed Action (Preferred) alternative represents the activities proposed by the applicant for the IHA, along with required monitoring and mitigation measures that would minimize potential adverse environmental impacts.

Under the requirements of the MMPA, if the proposed action will have no more than a negligible impact on the species or stocks; will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses; and sets forth the appropriate level of mitigation measures and monitoring, then NMFS shall issue the IHA.

2.1 PROJECT OBJECTIVES

L-DEO's proposed survey will use two dimensional (2-D) seismic methodologies to obtain high-resolution, 2–D structures of the area's magmatic systems and thermal structures. The results of the data collection will enable the researchers to provide data necessary to decipher the crustal structure of the Shatsky Rise; address major questions of earth history, geodynamics, and tectonics; and improve estimates of regional earthquake occurrence and distribution.

L–DEO, the *Langseth's* operator, will conduct all planned seismic data acquisition activities, with on-board assistance by the scientists who have proposed the study. The principal investigators for this survey are Drs. Jun Korenaga (Yale University, New Haven, CT) and William Sager (Texas A&M University, College Station, TX). The vessel will be self-contained, and the crew will live aboard the vessel for the entire cruise.

The *Langseth* would depart from Yokohama, Japan on March 24, 2012 and transit to the survey area in the northwest Pacific Ocean, approximately 1,200 kilometers (km) (745.6 miles (mi)) in international waters offshore of the east coast of Japan. The study area which is approximately 1,200 km (745.6 mi) from Japan will encompass an area on the Shatsky Rise bounded by approximately 33.5–36 degrees (°) North by 156–161° East. Water depths in the survey area range from approximately 3,000 to 5,000 meters (m) (1.9 to 3.1 mi). (Figure 1). At the conclusion of the survey activities, the *Langseth* proposes to arrive in Honolulu, Hawaii, on April 16, 2012.

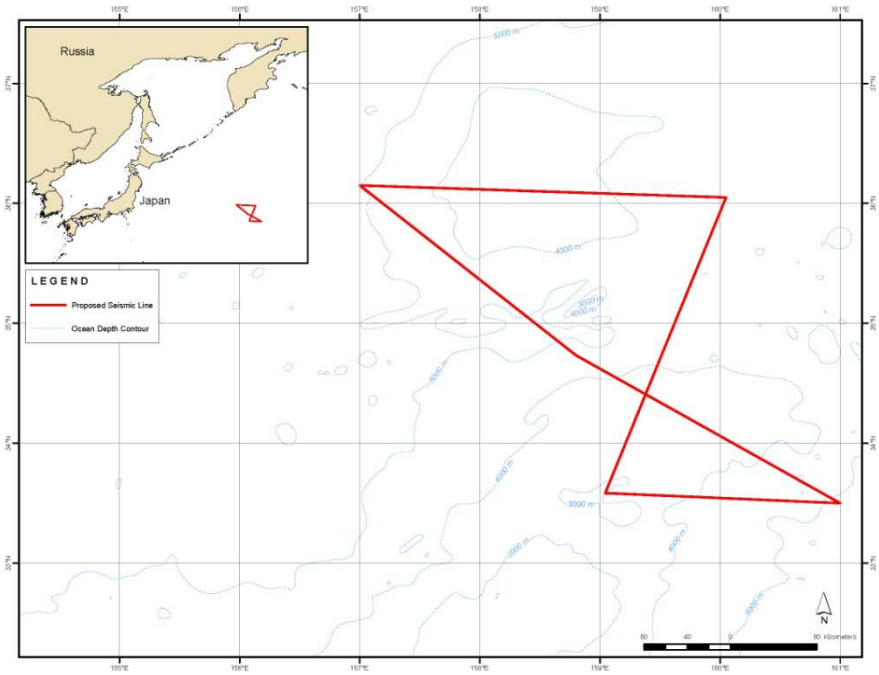

Figure 1 Study area and proposed survey design for the seismic survey in the northwestern Pacific Ocean planned for 24 March–16 April 2012 with seismic tracklines.

The proposed seismic survey will involve one source vessel, the *Langseth* which will deploy a 36-airgun array with a total volume of 6,600 cubic inches (in^3). The *Langseth* will tow the airgun array 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 (Figure 2) (NSF, 2010b). The sound penetrates the seafloor and returns to a receiver called a hydrophone. The reflected data provides information on sub-sea floor sediment layers.

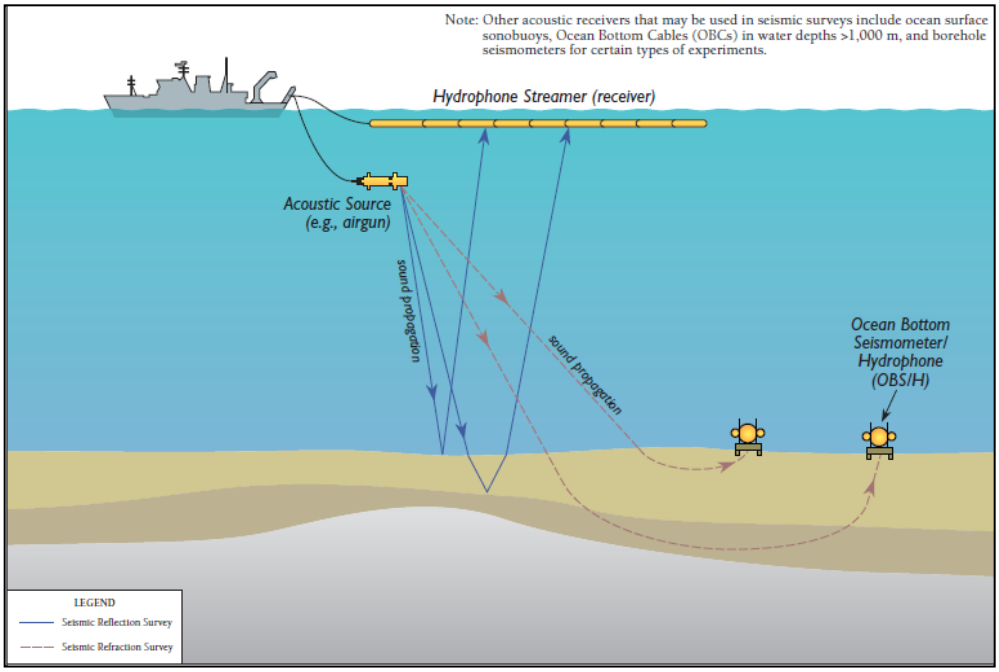

Figure 2 General concept of airgun arrays and hydrophones (NSF, 2010).

2.2 ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Evaluation of the No Action Alternative is required by CEQ NEPA regulations as an environmental baseline against which the impacts of the Proposed Action are compared.

Under the No Action Alternative, NMFS would not issue an IHA to L-DEO for the taking, by Level B harassment, of small numbers of marine mammals, incidental to conducting a marine geophysical (seismic) survey in the northwest Pacific Ocean from March 24 to May 7, 2012. L-DEO would not conduct the seismic survey and marine mammals present in the survey area would not be incidentally harassed. This alternative would eliminate any potential risk to the environment from the proposed research activities. However, L-DEO would not receive an exemption from the MMPA and ESA prohibitions against incidental take that would allow L-DEO to conduct the seismic survey in compliance with these statutes.

2.3 ALTERNATIVE 2 – ISSUANCE OF AN IHA WITH MITIGATION (PREFERRED)

The Proposed Action is the Preferred Alternative and the analysis of the potential impacts of this alternative are analyzed in the NSF/L-DEO Report and in NSF's EA and is hereby incorporated by reference (LGL, 2012; NSF, 2012). Under this alternative, NMFS would issue an IHA (valid from March 24 to May 7, 2012) to L-DEO allowing the incidental take, by Level B harassment, of 30 species of marine mammals in the northwest Pacific Ocean. The project is scheduled to commence on March 24, 2012 and scheduled to end on April 16, 2012, however NMFS is proposing to issue the IHA until May 7, 2012 in case of operational delays.

NMFS will incorporate the mitigation and monitoring measures and reporting requirements described in Sections II(3) of the NSF/L-DEO Report (LGL, 2012) into the IHA. Accordingly, this NEPA Preferred Alternative (Issuance of an IHA with Mitigation) would satisfy the purpose and need of the NMFS MMPA action—issuance of an IHA, along with required mitigation measures and monitoring, and would enable NSF and L-DEO to comply with the statutory and regulatory requirements of the MMPA and ESA.

2.3.1 SEISMIC ACQUISITION OPERATIONS

The NSF/L-DEO Report (LGL, 2012) describes the survey protocols in detail and this EA briefly summarizes them here.

The proposed study (*e.g.*, equipment testing, startup, line changes, repeat coverage of any areas, and equipment recovery) will take place in the northwest Pacific Ocean in water depths ranging from 3,000 to 5,000 m (1.9 to 3.1 mi). The survey will require approximately 7 days (d) to complete approximately 1,216 km (755.6 mi) of transect lines. The *Langseth* will 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. Data acquisition will include approximately 168 hours (hrs) of airgun operation (7 d x 24 hrs).

Seismic Airguns: The *Langseth* will deploy a 36-airgun array, with a total volume of approximately 6,600 in^3 at a tow depth of 9 m (29.5 ft). The airguns are a mixture of Bolt 1500LL and Bolt 1900LLX airguns ranging in size from 40 to 360 in^3, with a firing pressure of 1,900 pounds per square inch. The dominant frequency components range from zero to 188

Hertz (Hz) and the nominal source levels of the airgun array are 220 to 249 decibels (dB) re: 1 μPa[1].

The array configuration consists of four identical linear strings, with 10 airguns on each string; the first and last airguns will be spaced 16 m (52 ft) apart. Of the 10 airguns, nine will fire simultaneously while the tenth airgun will serve as a spare and will be turned on in case of failure of one of the other airguns. The *Langseth* will distribute the array across an area of approximately 24 x 16 m (78.7 x 52.5 ft) and will tow the array approximately 140 m (459.3 ft) behind the vessel. The tow depth of the array will be 9 m (29.5 ft). During the multichannel seismic survey, each airgun array will emit a pulse at approximately 20-second (s) intervals which corresponds to a shot interval of approximately 50 m (164 ft). During firing, the airguns will emit a brief (approximately 0.1 s) pulse of sound; during the intervening periods of operations, the airguns will be silent.

Multibeam Echosounder: The *Langseth* will operate a Kongsberg EM 122 MBES concurrently during airgun operations to map characteristics of the ocean floor. The hull-mounted MBES emits brief pulses of sound (also called a ping) (10.5 to 13 kilohertz (kHz)) in a fan-shaped beam that extends downward and to the sides of the ship. The transmitting beamwidth is 1 or 2° fore-aft and 150° athwartship and the maximum source level is 242 dB re: 1 μPa.

For deep water operations, each ping consists of eight (in water greater than 1,000 m; 3,280 ft) or four (less than 1,000 m; 3,280 ft) successive, fan-shaped transmissions, from two to 15 milliseconds (ms) in duration and each ensonifying a sector that extends 1° fore-aft. Continuous wave pulses increase from two to 15 ms long in water depths up to 2,600 m (8,530 ft). The MBES uses frequency-modulated chirp pulses up to 100-ms long in water greater than 2,600 m (8,530 ft). The eight successive transmissions span an overall cross track angular extent of about 150°, with 2-ms gaps between the pulses for successive sectors.

Sub-bottom Profiler: The *Langseth* will also operate a Knudsen Chirp 3260 SBP concurrently during airgun and MBES operations to provide information about the sedimentary features and bottom topography. The SBP is capable of reaching depths of 10,000 m (6.2 mi). The dominant frequency component of the SBP is 3.5 kHz which is directed downward in a 27º cone by a hull-mounted transducer on the vessel. The nominal power output is 10 kilowatts (kW), but the actual maximum radiated power is three kW or 222 dB re: 1 μPa. The ping duration is up to 64 ms with a pulse interval of one second, but a common mode of operation is to broadcast five pulses at 1-s intervals followed by a 5-s pause.

2.3.2 MITIGATION AND MONITORING MEASURES

The NSF/L-DEO Report (LGL, 2012) describes the required mitigation and monitoring measures in detail and this EA briefly summarizes them here.

To reduce the potential for disturbance from acoustic stimuli associated with the activities, L-DEO and/or its designees have proposed to implement the following mitigation measures for marine mammals: (1) proposed exclusion zones; (2) visual monitoring by Protected Species

[1] 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.

Visual Observers (PSVO); (3) power-down procedures; (4) shutdown procedures; (5) ramp-up procedures; and (6) passive acoustic monitoring.

In the IHA, NMFS would include mandatory requirements for NSF/L-DEO to use these mitigation measures in order to achieve the MMPA requirement of effecting the least practicable impact on each species or stock of marine mammal.

Proposed Exclusion Zones: 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. L-DEO uses the thresholds to establish mitigation exclusion zones, (*i.e*., if an animal enters an area calculated to be ensonified above the level of an established threshold, the *Langseth* either decreases the number of airguns in use to reduce the acoustic footprint of the sound source around the vessel or shuts down the sound source).

Visual Monitoring: During seismic operations in the northwest Pacific Ocean, at least four PSVOs would be based aboard the *Langseth* for the duration of the cruise and would watch for marine mammals near the vessel during daytime airgun operations and during any start-ups at night. PSVOs would record data to estimate the numbers of marine mammals exposed to various received sound levels and to document reactions or lack thereof. They would also provide information needed to order a power-down or shutdown of the seismic source when a marine mammal is within or near the exclusion zone. L-DEO would use the data to estimate numbers of animals potentially 'taken' by harassment (as defined in the MMPA).

Power-Down Procedures: L-DEO would decrease the number of airguns in use such that the radius of the 180-dB re: 1 µPa exclusion zone is decreased to the extent that marine mammals are no longer in or about to enter the exclusion zone.

Shutdown Procedures: L-DEO would shut down the operating airgun(s) if a marine mammal is seen within or approaching the exclusion zone for the single airgun. L-DEO will not resume airgun activity until the marine mammal has cleared the exclusion zone, or until the PSVO is confident that the animal has left the vicinity of the vessel.

Ramp-Up Procedures: L-DEO would initiate a ramp-up procedure with the smallest airgun in the array after 8 minutes of non-active airgun operations or when a power down has exceeded 8 minutes. This 8-minute period is based on the 180-dB re: 1 µPa radius (940 m; 3,083 feet (ft)) for the 36-airgun array towed at a depth of 9 m (29.5 ft) in relation to the minimum planned speed of the *Langseth* while shooting (8.5 km per hour (km/hr); 5.3 miles per hour (mph); 4.6 knots (kts)). L–DEO has used similar periods (8 to 10 minutes) during previous L–DEO surveys.

Passive Acoustic Monitoring: L-DEO would use acoustical monitoring in addition to visual observations to improve detection, identification, and localization of cetaceans. The acoustic monitoring would serve to alert visual observers (*if on duty*) when vocalizing cetaceans are detected.

2.3.3 REPORTING

The NSF/L-DEO Report (LGL, 2012) describes the required monitoring and reporting measures in detail and this EA briefly summarizes them here.

L-DEO will submit a report to NMFS and NSF within 90 days after the end of the cruise. The report will describe the operations that were conducted and sightings of marine mammals and turtles near the operations. The report will provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report will summarize the dates and locations of seismic operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities). The report will also include estimates of the number and nature of exposures that could result in "takes" of marine mammals by harassment or in other ways.

Reporting Prohibited Take: 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), L-DEO shall immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS and the NMFS Pacific Islands Regional Stranding Coordinator. Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with L-DEO to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. L-DEO may not resume their activities until notified by NMFS via letter, email, or telephone.

Reporting an Injured or Dead Marine Mammal with an Unknown Cause of Death: In the event that L-DEO discovers an injured or dead marine mammal, and the lead PSVO determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.*, in less than a moderate state of decomposition as described in the next paragraph), L-DEO shall immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS and the NMFS Pacific Islands Regional Stranding Coordinator. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with L-DEO to determine whether modifications in the activities are appropriate.

Reporting an Injured or Dead Marine Mammal not Related to L-DEO Activities: In the event that L-DEO discovers an injured or dead marine mammal, and the lead PSVO determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), L-DEO will report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS and the NMFS Pacific Islands Regional Stranding Coordinator within 24 hrs of the discovery. L-DEO will provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS.

2.3.4 ESTIMATED TAKE OF MARINE MAMMALS BY INCIDENTAL HARASSMENT

The NSF/L-DEO Report (LGL, 2012) describes the estimated take by incidental harassment in detail and this EA briefly summarizes them here.

Only take by Level B harassment is anticipated to be authorized as a result of the marine geophysical survey in the northwest Pacific Ocean. Acoustic stimuli (*i.e.*, increased underwater sound) generated during the operation of the seismic airgun array may have the potential to cause marine mammals in the survey area to be exposed to sounds at or greater than 160-dB re: 1 µPa or cause temporary, short-term changes in behavior. There is no evidence that the planned activities could result in injury, serious injury or mortality within the specified geographic area for which L-DEO seeks the IHA. Take by injury, serious injury, or mortality is thus neither anticipated nor proposed to be authorized. NMFS has determined that the required mitigation and monitoring measures will minimize any potential risk for injury or mortality.

L-DEO's estimates are based on a consideration of the number of marine mammals that could be disturbed appreciably by operations with the 36-airgun array to be used during approximately 1,216 km (755.6 mi) of survey lines in the northwest Pacific Ocean. Density data on the marine mammal species in the survey area were available from several sources:

- Japanese sighting surveys conducted since the early 1980s and fisheries observers in the high-seas driftnet fisheries during 1987–1990; (Hakamada, Matsuoka, & Miyashita, 2009; Hakamada, Matsuoka, & Nishiwaki, 2004; Kato & Miyashita, 1998; Kitakado, Shimada, Okamura, & Miyashita, 2008; Miyashita, 1993);
- a 2002 Hawaiian Islands survey (Barlow, 2006); and
- surveys of the California Current ecosystem off the U.S. west coast between 1991 and 2005 (Barlow & Forney, 2007).

The total estimate of the number of individual cetaceans that could be exposed to seismic sounds with received levels greater than or equal to 160 dB re: 1 µPa during the survey is 7,354 (Table 4, NSF/L-DEO Report). That total includes 74 baleen whales, 39 of which are endangered: 5 humpback whales or 0.53% of the regional population, 21 sei whales (0.21%), 9 fin whales (0.05%), and 4 blue whales (0.13%). In addition, 12 sperm whales (also listed as endangered under the ESA) or 0.04% of the regional population could be exposed during the survey, and 108 beaked whales including Cuvier's, Longman's, Baird's, and Blainville's beaked whales. Most (96 %) of the cetaceans potentially exposed are delphinids; short-beaked common, striped, pantropical spotted, and Pacific white-sided dolphins are estimated to be the most common species in the area, with estimates of 3,569 (0.12% of the regional population), 1,374 (0.24%), 812 (0.19%), and 420 (0.04%) exposed to received levels greater than or equal to 160 dB re: 1 µPa, respectively.

NMFS does not expect the activity to impact rates of recruitment or survival of the marine mammals since no mortality (which would remove individuals from the population) is expected to result from the proposed activity. NMFS and L-DEO do not anticipate any injuries, serious injuries, or mortalities to occur as a result of the L-DEO's planned marine seismic survey, and none are proposed to be authorized by NMFS. Only short-term behavioral disturbance is anticipated to occur due to the brief and sporadic duration (7 days) of the survey activities.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

NMFS considered the alternative where NMFS issues an IHA without the mitigation measures described in Alternative 2, Issuance of an IHA with Mitigation (the Preferred Alternative). However, this alternative failed to meet the statutory and regulatory requirements of the MMPA for an IHA (*e.g*., negligible impact, effecting the least practicable impact, and monitoring and reporting of such takings). Accordingly, NMFS did not consider this alternative further.

NMFS also considered an alternative whereby NMFS issues the IHA for another time. This alternative, analyzed in the NSF/L-DEO Report and the NSF NEPA Analysis, is hereby incorporated by reference (LGL, 2012; NSF, 2012). However, this alternative failed to meet the statutory and regulatory requirements of the MMPA for an IHA as L-DEO did not submit an application (*i.e*., under the MMPA NMFS shall issue an IHA upon request) to conduct the seismic survey at an alternate time. The proposed dates for the cruise (March – May, 2012) are the most suitable dates that would best meet the purpose and need, from a logistical perspective, for NSF, L-DEO, the *Langseth*, and its crew. The potential environmental impacts of this alternative would be very similar or identical to the impacts of the proposed action.

3. CHAPTER 3 – AFFECTED ENVIRONMENT

The summary of the physical and biological environment of the study area, as analyzed in the NSF/L-DEO Report, are hereby incorporated by reference (LGL, 2012). The NSF/L-DEO Report presents baseline information necessary for consideration of the alternatives and describes the resources that would be affected by the alternatives, as well as environmental components that would affect the alternatives if they were to be implemented. Section 3.1 through 3.3 of the EA briefly summarizes them.

In addition to the marine mammal stocks and species that are the subject of the IHA, an assortment of sea birds, sea turtles, fish, and invertebrates may be found in the action area. Section 3.2.2 – 3.2.5 of this EA briefly summarizes these species. However, potential adverse impacts to these marine species located in the action area were considered unlikely, and, thus received less detailed evaluation than marine mammals.

3.1 PHYSICAL ENVIRONMENT

3.1.1 BATHYMETRY, GEOLOGY, AND OCEANOGRAPHY

Bathymetry: The Shatsky Rise, the largest plateau in the Pacific Ocean, covers three-quarters of a million square kilometers (NMFS, 2010a; Sliter & Brown, 1993), formed at the Pacific-Farallon-Izanagi triple junction during the late Jurassic to early Cretaceous (Sager, 2005). The water depths on the rise range from 1,207 to 5,000 m (0.75 to 3.1 mi) (Norton, 2007).

Geology: Its origin is unclear, but most geologists accept volcanism from a mantle plume or plume head as a plausible explanation (Sager, 2005). The rise consists of three large, isolated volcanic edifices (massifs), surrounded by nearly normal lithosphere, a linear volcanic ridge, and a group of about 80 scattered seamounts (Sager, Kim, Klaus, Nakanishi, & Khankishieva, 1999). The massif flank slopes are typically gentle (approximately 1.5°) parallel, magnetic, fracture zones. The slope angles imply effusive volcanism, similar to flood basalts, whereas the rise shape suggests formation near the Pacific-Izanagi-Farallon triple junction with modification of volcano flanks by spreading-ridge tectonics (Sager et al., 1999).

Oceanography: The largest and southernmost of the three seamounts is located at and at the approximate intersection of three oceanographic provinces: the Kuroshio Current Province to the northwest, the North Pacific Polar Front Province to the northeast, and the North Pacific Subtropical Gyre Province to the south (Longhurst, 2007). Surface oceanic circulation within the survey area is associated with the Kuroshio Extension (KE) a warm-water current that bifurcates at the Shatsky Rise (Hurlburt & Metzger, 1998) and the Oyashio Current, a cold-water current located northeast of the KE (Zainuddin, Kiyofuji, Saitoh, & Saitoh, 2006). More information about the area's oceanography may be found in Chapter III in the NSF/L-DEO Report (LGL, 2012).

3.2 SOCIAL AND ECONOMIC ENVIRONMENT

Socioeconomics comprise the basic attributes and resources associated with the human environment, particularly population and economic activity. This section addresses the socioeconomic effects of the proposed action on commercial and recreational fishing, tourism, and subsistence use.

3.2.1 COMMERCIAL FISHING

The dynamics of the physical oceanographic structures in this region results in a highly productive habitat, which serves as a feeding ground for various commercially-important species, such as tuna, anchovy (*Engraulis japonicus*) and sardine (*Sardinops melanostictus*), Pacific saury (*Cololabis saira*) and squid (*Berryteuthis sp*.) (Zainuddin et al., 2006).

In the offshore waters of the northwest Pacific Ocean, tuna is the primary fishery and the Western and Central Pacific Fisheries Commission (WCPFC) regulates this fishery. Tuna are caught using longlines, pole-and-line, purse seines, and trolls. In 2010, commercial fishers extracted a total of approximately 2.4 million tons (mt) of albacore (*Thunnus alalunga*), bigeye (*Thunnus obesus*), skipjack (*Katsuwonus pelamis*), and yellowfin (*Thunnus albacares*) tuna in the WCPFC region (WCPFC, 2010). Most tuna (1.8 mt) were caught in purse seines. In 2010, there were 4,548 longline, 1,482 purse seine, and 493 pole-and-line vessels active in the WCPFC Statistical Area (WCPFC, 2010).

3.3 BIOLOGICAL ENVIRONMENT

3.3.1 MARINE MAMMALS

Thirty-four marine mammal species may occur in the Shatsky Rise survey area, including 26 odontocetes (toothed cetaceans), seven mysticetes (baleen whales) and one species of pinniped during March through April. Six of these species are listed as endangered under ESA, including the blue, fin, humpback, north Pacific right, sei, and sperm whales. Based on available data, the western north Pacific gray whale may have the potential to migrate off of the Pacific coast of Japan (Reilly et al., 2000), though any occurrence in the survey area would be rare as gray whales are known to prefer nearshore coastal waters. Based on available data, NMFS does not expect to encounter the western north Pacific gray whale within the proposed study area and the NSF/L-DEO Report (LGL, 2012) does not present analysis for this species.

The species of marine mammals expected to be most common in the survey area (all delphinids) include the short-beaked common, striped, and Fraser's dolphins, and Dall's porpoise. NMFS refers the reader to Sections III and IV of the NSF/L-DEO Report (LGL, 2012) or to the respective Stock Assessment Reports for each species, which are available online at http://www.nmfs.noaa.gov/pr/sars/species.htm for detailed information regarding the abundance and distribution, population status, and life history and behavior of these species and their occurrence in the proposed project area.

3.3.2 SEABIRDS

One seabird species of conservation concern, the short-tailed albatross (*Phoebastria albatrus*), is known to occur in or near the proposed study area in the northwest Pacific Ocean. The short-tailed albatross is listed as endangered under the ESA. More information about this species may be found in Section III of the NSF/L-DEO Report (LGL, 2012).

Another species, the flesh-footed shearwater (*Puffinus carneipes*), may migrate through the Kuroshio/Oyashio transition system. Non-breeding flesh-footed shearwaters are noted to occupy regions of high fisheries activity (Rayner et al., 2011).

3.3.3 MARINE TURTLES

Five species of marine turtles could occur in the proposed study area during the proposed seismic activities. They include the green (*Chelonia mydas*); hawksbill (*Eretmochelys imbricata*); leatherback (*Dermochelys coriacea*); loggerhead (*Caretta caretta*); and olive ridley (*Lepidochelys olivacea*) sea turtles. The species of marine turtle that could be commonly encountered in the survey area include foraging individuals of any species or juvenile loggerheads migrating through the KE Bifurcation Region (Polovina et al., 2006). More information about each species may be found in Section III of the NSF/L-DEO Report (LGL, 2012).

3.3.4 FISH

Examples of fish present in the northwest Pacific Ocean (SAUP, 2011) include species important to commercial and recreational fisheries such as albacore tuna (*Thunnus alalunga*); bigeye tuna (*Thunnus obesus*); chub mackerel (*Scomber japonicus*); Indo-Pacific blue marlin (*Makaira mazara*); skipjack tuna (*Katsuwonus pelamis*); Pacific jack mackerel (*Trachurus symmetricus*); striped marlin (*Tetrapturus audax*); and yellowfin tuna (*Thunnus albacares*).

3.3.5 INVERTEBRATES AND LOWER TROPHIC ORGANISMS

Examples of invertebrates present in the northwest Pacific Ocean include pelagic squids, sharks, rays and chimaeras (SAUP, 2011). The commercially-important pelagic squid are widely dispersed throughout the Shatsky Rise area, short-lived, and have relatively high fecundity rates (Wetherall, 1991).

Lower trophic organisms (*e.g.*, phytoplankton and zooplankton) serve as the basis of the food web in the world's oceans providing nutrition for birds, fish, marine turtles, marine mammals and humans. The primary productivity of the Kuroshio Current Large Marine Ecosystem is 422 $mgC \cdot m^{-2} \cdot day^{-1}$, and the mean primary production in the area ranges from 1,207 to 2,093 $mgC \cdot m^{-2} \cdot day^{-1}$ March through May (SAUP, 2012).

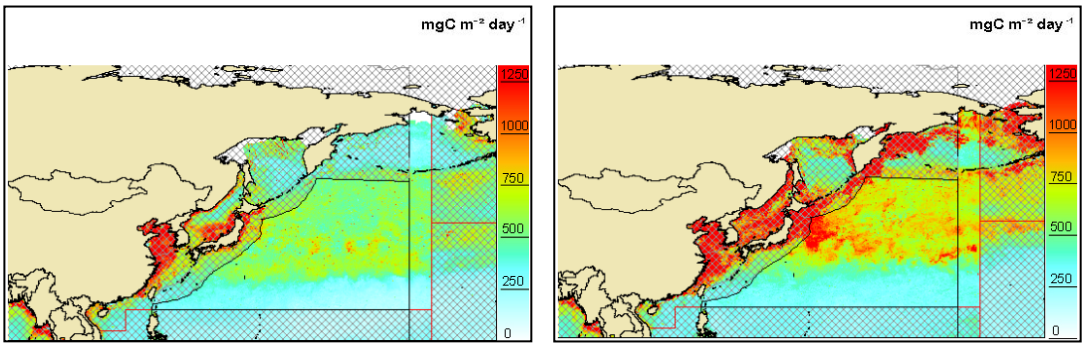

Figure 3 Annual Mean Primary Production in the Northwest Pacific Ocean March (left) and April (Right) (SAUP, 2012).

4. CHAPTER 4 –ENVIRONMENTAL CONSEQUENCES

The NSF NEPA Analysis and the NSF/L-DEO Report, which address potential direct, indirect, and cumulative impacts of the proposed marine seismic survey on marine mammals, sea turtles, fish, and invertebrates, and impacts to prey species and marine mammal habitats, are hereby incorporated by reference (LGL, 2012; NSF, 2012). NMFS finds that the NSF NEPA Analysis and the NSF/L-DEO Report facilitate a meaningful analysis of the direct, indirect, and cumulative effects of L-DEO's proposed action on marine mammals and other marine species, including marine turtles, seabirds, fish, and invertebrates.

Under the MMPA, NMFS has evaluated the potential impacts of L-DEO's action in order to determine whether to authorize incidental take of marine mammals. Under the NEPA, NMFS has determined that an EA is appropriate to evaluate the potential significance of environmental impacts to the marine environment resulting from the proposed L-DEO action that would occur after issuance of this IHA.

4.1 EFFECTS OF ALTERNATIVE 1 – NO ACTION ALTERNATIVE

The summary of the effects of the No Action alternative, analyzed in the NSF NEPA Analysis and the NSF/L-DEO Report, are hereby incorporated by reference (LGL, 2012; NSF, 2012). There are no direct or indirect effects on the environment of not issuing the IHA. The incidental take of marine mammals, including those listed as threatened or endangered, resulting from L-DEO's survey would not be exempted. It is unlikely the applicant would conduct the research in the absence of a permit, because to do so would risk sanctions and enforcement actions under the MMPA and ESA.

4.2 EFFECTS OF ALTERNATIVE 2 – PREFERRED ALTERNATIVE

The NSF NEPA Analysis and the NSF/L-DEO Report, incorporated by reference (LGL, 2012; NSF, 2012), describe, in detail, the potential effects of airgun sounds, multibeam echosounder and sub-bottom profiler signals on marine species, particularly marine mammals and marine turtles of particular concern (see Section IV and Appendices B through E of the NSF/L-DEO Report). The NSF/L-DEO Report also includes analyses of effects on sea turtles, fish, and invertebrates.

L-DEO proposed a number of monitoring and mitigation measures for marine mammals as part of the action evaluated in the NSF NEPA Analysis and the NSF/L-DEO Report. In analyzing the effects of the preferred alternative, NMFS has considered the following monitoring and mitigation measures as part of the preferred alternative as considered by NSF:

(1) proposed exclusion zones;
(2) power-down procedures;
(3) shut-down procedures;
(4) ramp-up procedures;
(5) visual monitoring by PSVOs; and
(6) passive acoustic monitoring.

Inclusion of these monitoring and mitigation measures is anticipated to minimize and/or avoid impacts to marine resources. With the above planned monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and sea turtle that could be encountered are expected to be limited to short-term, localized changes in behavior (such as brief masking of natural sounds) and short-term changes in animal distribution near the seismic vessel. At most, effects on

marine mammals may be interpreted as falling within the MMPA definition of "Level B behavioral harassment" for those species managed by NMFS. Under the proposed action, NMFS expects no long-term or substantial adverse effects on marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats.

NMFS does not anticipate that take by injury (Level A harassment), serious injury, or death will occur and expects that harassment takes should be at the lowest level practicable due to the incorporation of the mitigation measures proposed in the application, the NSF NEPA Analysis and the NSF/L-DEO Report and NMFS' notice of proposed IHA (77 FR 4765, January 31, 2012), nor would take by injury, serious injury, or mortality be authorized by this IHA.

4.2.1 IMPACTS TO THE PHYSICAL ENVIRONMENT

Based on a review of the data, NMFS expects no significant direct impacts from the action of issuing an IHA for the incidental take, by Level B harassment, of small numbers of marine mammals to L-DEO during the conduct of the seismic survey. L-DEO's survey activities are not expected to disturb the geology, oceanography, nor the bathymetry of the area surrounding the survey area. The applicant's temporary acoustic activities would not affect physical habitat features, such as substrates and water quality.

4.2.2 IMPACTS TO MARINE MAMMALS AND SEA TURTLES

NMFS does not expect the authorization to have a significant effect on the living marine resources that may be important resources in Shatsky Rise area. The impacts of the seismic survey on marine mammals and sea turtles are specifically related to acoustic activities, and these are expected to be temporary in nature, negligible, and would not result in substantial impact to marine mammals or to their role in the ecosystem.

Additionally, the effects from vessel transit and routine operation of one seismic source vessel would not result in substantial damage to ocean and coastal habitats that might constitute marine mammal habitats. The potential for striking marine mammals and sea turtles 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 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 *Langseth's* slow survey speed (8.5 km/hr; 5.3 miles per hour (mph); 4.6 knots (kts)). L-DEO 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.

The probability of marine mammal interactions occurring during transit to and from the survey area is unlikely due to the *Langseth's* slow cruising speed which is approximately 11.5 mph (18.5 km/hr; 10 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).

NMFS anticipates, and would authorize, the incidental take, by Level B harassment only, in the form of temporary behavioral disturbance, of several species of cetaceans. NMFS does not anticipate that take by injury (Level A harassment), serious injury, or death would occur and expects that harassment takes should be at the lowest level practicable due to the incorporation of the mitigation measures required by the proposed IHA and analyzed in this EA and in the NSF NEPA Analysis and the NSF/L-DEO Report. The Level B harassment is not expected to affect biodiversity or ecosystem function. As with marine mammals, sea turtles may experience

temporary hearing threshold shifts and may exhibit relatively minor and short-term behavioral responses.

4.2.3 POTENTIAL CONSEQUENCES TO OTHER LIVING MARINE RESOURCES

NMFS' evaluation indicates that any direct or indirect effects of the action would not result in a substantial impact to living marine resources (*i.e.*, any seabirds, fish, invertebrate, or lower trophic species) or their habitats and would not have any adverse impacts on biodiversity or ecosystem function. Most effects of the proposed action are considered to be short-term, temporary in nature, and negligible, and unlikely to affect normal ecosystem function or predator/prey relationships; therefore, there will not be a substantial impact on marine life biodiversity or on the normal function of the high seas marine environment.

L-DEO proposes to conduct the proposed open-water marine geophysical survey for a short period of time in deep-water (approximately 5,000 m; 3.1 mi in depth). As the *Langseth* transits the area while conducting the survey, any displacement of marine fish species by the proposed action would be temporary. Many fish species (*i.e.*, those that do not have swim bladders, have rudimentary swim bladders (such as bottom-dwelling species, including flatfish), or well-developed swim bladders that are not directly connected to the ears) tend to have relatively poor auditory sensitivity and are not likely to be affected by exposure to intense noise. The seismic survey may potentially displace prey items of marine mammals, such as fish. However, prey items would return after the *Langseth* and the towed airgun array have transited through the area and the ambient sound has returned to baseline levels.

The overall response of fishes and squids is to exhibit startle responses and undergo vertical and horizontal movements away from the sound source. NMFS expects that the seismic survey would have no more than a temporary and minimal adverse effect on any fish or invertebrate species and no cumulative effects on the environment. Although there is a potential for injury to fish or marine life in close proximity to the seismic airguns, the impacts of the seismic survey on fish and other marine life specifically related to acoustic activities are expected to be temporary in nature, negligible, and would not result in substantial impact to these species or to their role in the ecosystem.

NMFS conducted additional literature reviews for purposes of the MMPA analyses, and applicable information is included here to support this finding. Sperm whales regularly feed on squid and some fishes and may be feeding while in the area during the proposed survey. One study[2] investigating behavioral response of southern calamari squid (*Sepioteuthis australis*) exposed to seismic survey sound reported that the squid exhibited both startle and avoidance responses. It is expected that sperm whales remaining in this area would experience indirect effects from airgun activities through temporary behavioral disruptions and reduced feeding opportunities. Like their prey, sperm whales are expected to move out of the survey area temporarily and return to the area once survey activities are complete and prey species return.

Available data suggest that sound energy from the airguns will diminish dramatically by the time it travels more than 1,000 m (3,820 ft) to the ocean floor. The seismic program in the northwest

[2] McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, and K. McCabe. 2000b. Marine seismic surveys – a study of environmental implications. APPEA J. 40:692-706.

Pacific Ocean is not expected to significantly impact benthic and invertebrate communities in the study area.

The existing body of information on the impacts of seismic survey sound on marine invertebrates and benthic fauna is very limited. Recent controlled field experiments (Christian, Mathieu, & Buchanan, 2003) on adult crustaceans exposed to seismic energy found no pathological impacts to the research animals. The study reported that the seismic survey did not: (1) cause any acute or mid-term mortality of the snow crabs (*Chionoecetes opilio*); (2) alter feeding behavior; or (3) affect embryo survival or post-hatch locomotion of larvae.

4.2.4 IMPACTS TO COMMERCIAL FISHING

The *Langseth's* streamer may become entangled with fishing gear. L-DEO will employ avoidance tactics as necessary to prevent conflict. It is not expected that L-DEO's operations will have a significant impact on commercial fisheries in the northwest Pacific Ocean. Nonetheless, L-DEO will minimize the potential to have a negative impact on the fisheries by avoiding areas where fishing is actively underway. More information about impacts on commercial fishing is in Section IV of the NSF/L-DEO Report (LGL, 2012).

4.2.5 REVIEW OF THE 2010 SHATSKY RISE MONITORING REPORT

In 2010, NMFS issued an IHA to L-DEO for a seismic survey on the Shatsky Rise in the northwest Pacific Ocean, July – September, 2010. NMFS estimated that the maximum number of marine mammals that could potentially experience Level B harassment, incidental to the conduct of the seismic survey, was 19,934 individuals. Most (96%) of the cetaceans that could be potentially exposed were delphinids: short-beaked common, striped, pantropical spotted, and Pacific white-sided dolphins, with maximum estimates of 9,666 (0.3% of the regional population), 3,721 (0.7%), 2,200 (0.5%), and 1,137 (0.1%) exposed to levels greater than or equal to 160 dB re: 1 μPa, respectively. As required by the IHA, L-DEO submitted a monitoring report on the cruise in December 2010 (Holst & Beland, 2010).

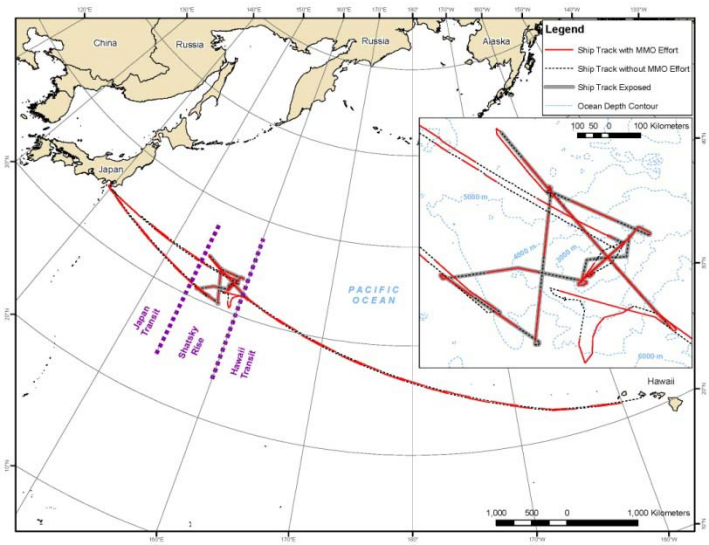

Figure 4 Map of the Shatsky Rise study area showing ship tracks and acquired seismic lines during 17 July – 13 September 2010 (Holst & Beland, 2010).

Cruise Information: The cruise occurred from July 17 to September 13, 2010, during which L-DEO towed a 36-airgun array with a total discharge volume of 6,600 in^3 behind the *Langseth* at a depth of 9-12 m (29.5-39.4 ft). The acoustic receiving system consisted of one 6-km streamer, also towed behind the *Langseth*. The vessel's crew also operated a 12-kHz MBES and a 3.5 kHz SBP throughout most of the study.

Operations: A total of 3,297 km (2,048 mi) of seismic operations and a total of 4,003 km (2,487 mi) of non-seismic operations took place within the seismic survey area. Overall, 718 hrs of visual observations took place during the Shatsky Rise cruise, of which 357 hrs occurred within the study area. Protected species visual observers (PSVO) conducted visual watches during all daylight seismic operations, including ramp-ups. All visual effort occurred during daylight periods and the *Langseth* did not implement any nighttime ramp ups. In addition, approximately 383 hrs of PAM occurred during seismic periods. However, L-DEO reported no acoustic detections of cetaceans during the entirety of the survey.

Sighting Data: During the 2010 cruise, the PSVO's reported 27 cetacean sightings totaling 781 individuals. However, the PSVOs only sighted one group of seven sperm whales during active seismic operations which resulted in one power down. The sperm whale was the most frequently encountered species (nine groups). PSVOs reported 5 cetacean sightings of 13 individuals and 4 groups (totaling 10 individuals) within the study area. Sightings within the study area included 3 groups of sperm whales, one group of unidentified dolphins, and one unidentified whale. Other species identified during the Shatsky Rise cruise included the minke whale, false killer whale, short-finned pilot whale, pantropical spotted dolphin, and Risso's dolphin. Four unidentified sea turtles were also sighted during the cruise, two of which were seen within the study area.

Closest Point of Approach (CPA): Within the study area, the mean CPA for sperm whales was closer during seismic periods (1,031 m; 0.64 mi, n = 1) compared with the CPA during non-seismic (2,000 m; 1.2 mi, n = 2). Because of the small sample size, L-DEO could not infer any meaningful comparisons of mean CPAs. The CPA for one unidentified whale seen during non-seismic in the study area was 3,132 m (1.9 mi). For useable sightings during transits to and from Japan, the mean CPA for sperm whales was 2,237 m (n = 5).

Behavior: The seven sperm whales sighted during seismic operations were recorded as swimming. The other two groups of sperm whales seen during non-seismic operations in the study area were seen logging and blowing. The behavior of the single unidentified whale seen during non-seismic operations was unknown. The behavior for the five 'useable' sightings of sperm whales during the Japan transits were recorded as swimming (n = 3), traveling (n = 1), and resting (n = 1).

Movement: The one group of sperm whales sighted during seismic operations was seen swimming parallel to the vessel. The movement for the groups of sperm whales seen during non-seismic periods within the study area was coded as no movement and unknown. The movement relative to the ship of the unidentified whale seen during non-seismic was also unknown. For the five 'useable' sightings during transits to and from Japan, sperm whale groups were seen swimming parallel to the vessel (n = 3), swimming away (n = 1), or swimming across the vessel path (n = 1).

NMFS' Evaluation of the Effectiveness of Previous Mitigation Measures: Given the limited sightings in the study area, the reader must interpret the monitoring report judiciously. Based on corrected densities of cetaceans, L-DEO estimated that approximately 13 individual whales were exposed to airgun sounds with received levels ≥160 dB re:1 μPa during the survey. This estimate is lower than the estimated total number of cetaceans authorized by NMFS (i.e., 22 sperm whales). These results did not refute NMFS' original findings under the ESA, NEPA, nor the MMPA. As such, NMFS believes that the planned monitoring program for the 2012 survey would be sufficient to detect (using visual monitoring and passive acoustic monitoring), with

reasonable certainty, marine mammals within or entering identified exclusion zones. NMFS has determined that the impact of conducting a similar action would result in Level B harassment (behavior) of small numbers of marine mammals and would have a negligible impact on the affected species or stocks of marine mammals.

4.3 COMPLIANCE WITH NECESSARY LAWS – NECESSARY FEDERAL PERMITS

NMFS has determined that the IHA is consistent with the applicable requirements of the MMPA, ESA, and NMFS' regulations. The applicant has secured or applied for necessary permits from NMFS.

4.4 UNAVOIDABLE ADVERSE IMPACTS

The summary of unavoidable adverse impacts to marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats occurring in the survey area analyzed in the NSF/L-DEO Report and NSF's NEPA Analysis are hereby incorporated by reference (LGL, 2012; NSF, 2012).

NMFS does not expect L-DEO's activities to have adverse consequences on the viability of marine mammals in the study area. Further, NMFS does 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 marine seismic survey will have a negligible impact on the affected species or stocks of marine mammals. The MMPA requirement of ensuring the proposed action has no unmitigable adverse impact to subsistence uses does not apply here because of the location of the proposed activity.

4.5 CUMULATIVE EFFECTS

The potential cumulative effects to marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats occurring in the survey area analyzed in the NSF/L-DEO Report and NSF's NEPA Analysis are hereby incorporated by reference (LGL, 2012; NSF, 2012).

The impacts of conducting the seismic survey on marine mammals and sea turtles 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. NMFS believes that the survey would not have any adverse cumulative effect on any fish or invertebrate species or their habitats.

NMFS has issued incidental take authorizations for other seismic research surveys (to L-DEO and other parties) that may have resulted in the harassment of marine mammals, but the other research surveys are dispersed both geographically (throughout the world) and temporally, are short-term in nature, and all are required to use mitigation and monitoring measures to minimize impacts to marine mammals and other living marine resources in the activity area. There are no other NSF-sponsored seismic surveys scheduled in the northwest Pacific Ocean from March through May, 2012; therefore, NMFS is 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.

5. LIST OF PREPARERS AND AGENCIES CONSULTED

Agencies Consulted
No other persons or agencies were consulted in preparation of this EA.

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