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Division of Ocean Sciences
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ENVIRONMENTAL ASSESSMENT AND DETERMINATION PURSUANT TO THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA), 42 U.S.C. 4321, *et seq.* AND EXECUTIVE ORDER 12114

Marine Seismic Survey in the Commonwealth of the Northern Mariana Islands, February – March 2012

FINDING OF NO SIGNIFICANT IMPACT

OCE# 0841074; OCE# 0841063
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Project Title: Collaborative Research: Mantle Serpentinization and Water Cycling Through the Mariana Trench and Forearc

This constitutes an environmental assessment (EA) by the National Science Foundation (NSF) for a marine seismic survey proposed to be conducted in February – March 2012 on board the research vessel (R/V) *Marcus G. Langseth* in the Pacific Ocean proximate to the Commonwealth of the Northern Mariana Islands (CNMI). This EA is based, in part, on an Environmental Assessment report prepared by LGL Limited environmental research associates (LGL) on behalf of NSF, entitled, "Environmental Assessment of a Marine Geophysical Survey by the R/V *Marcus G. Langseth* in the Commonwealth of the Northern Mariana Islands, February – March 2012" (Report # TA4858-1) (Attachment 1).

This survey was originally proposed to be conducted in 2010 and a draft environmental assessment (DEA) was prepared for the effort and was posted for public comment on the NSF website for 30 days. Ship maintenance issues resulted in schedule challenges that forced the survey into an inclement weather period and after further consideration by the PI and ship operator the survey was postponed until a more suitable operational period could be achieved. The DEA prepared for the 2010 survey was revised and updated for the proposed 2012 survey time period and potential environmental consequences (Attachment 1). NSF posted the draft environmental assessment on the NSF website for public comment from October 18, 2011 to November 18, 2011, but received no direct public comments during (or after) the open comment period.

Information in the DEA regarding the proposed ramp-up procedures after an extended power down was not included in the NMFS Federal Register notice for the proposed issuance for the Incidental Harassment Authorization (IHA). Consequently, the IHA will not reflect any changes in ramp-up procedure and therefore the proposed operational changes will not be implemented at this time. This operational change does not alter the LGL report conclusions.

The NSF assisted the National Marine Fisheries Service (NMFS) with responding to comments from the Marine Mammal Commission (MMC) in response to the NMFS Federal Register notice regarding the proposed issuance of an Incidental Harassment Authorization (IHA) for the survey. No changes were made to the LGL environmental assessment report as a result of the MMC comments.

The conclusions from the LGL report were used to inform the Division of Ocean Sciences (OCE) management of potential environmental impacts of the cruise. OCE has reviewed and concurs with the report's findings. Accordingly, the LGL report is incorporated into this environmental assessment by reference as if fully set forth herein. This environmental assessment also serves to support National Marine Fisheries Service (NMFS) NEPA compliance associated with its proposed issuance of an Incidental Harassment Authorization (IHA).

Project Objectives and Context

This research program aims to understand the water cycle within subduction-zone systems where Earth's major earthquakes occur. Little is known about either of these processes, but water cycling through the system is thought to be the primary controlling factor in both arc-crust generation and megathrust seismicity. The survey will take place over the Mariana outer forearc, the trench and the outer rise of the subducting and bending Pacific plate. The objective is to image upper mantle velocity structure so that the effects of plate bending can be assessed. The researchers will test the hypothesis that hydration (serpentinization) of the upper mantle, promoted by bending-related faulting, provides a mechanism for transporting water beneath the arc. Subsequent release of this water promotes mantle melting and volcanism. The field program will test this hypothesis by measuring mantle seismic sounds speeds, which vary with degree of serpentinization. By comparing these measurements from the Mariana system, which is old and cold, with the Costa Rica system, which is young and warm and where similar measurements have recently been made, it should be determinable whether or not substantial water is taken up by the mantle of subducting plates near the outer rise of seafloor trenches. The 2D field experiment will include an active and passive seismic component.

The Mariana Island arc, one of the MARGIN focus sites, represents an ideal location to constrain water flux due to the extensive work already done on volatile cycling, strong evidence for the importance of water in arc and backarc magmatism, the subduction of old lithosphere capable of storing more water, and the ability to sample forearc mantle fluids and rocks at serpentinite seamounts.

The information obtained from this study will increase knowledge of plate tectonics and the complex earth hydration system and provide useful data for a variety of other geologic studies. The information learned in this location may also be applicable to other similar geologic sites.

The project will be a collaborative effort, with scientists from multiple universities and supports graduate students.

Summary of Proposed Action and Alternatives

The procedures to be used for the survey will be similar to those used during previous seismic surveys by L-DEO and will use conventional seismic methodology. The proposed survey will take place from February through March 2012 in waters within the CNMI, a commonwealth in a political union with the United States (US) and thus considered within the US Exclusive Economic Zones (EEZ), and in International Waters (See Attachment 1, Figure 1). The seismic survey will consist of ~2800 km of transect lines (including turns) in deep (>2000 m) water. The survey will involve the R/V *Marcus G. Langseth* as the source vessel which will deploy an array of 36 airguns with a total discharge volume of ~6600 in^3. The receiving system will consist of a 6 km hydrophone streamer and ~85 ocean bottom seismometers (OBSs). As the airgun array is towed along the survey lines, the hydrophone streamer will receive the returning acoustic signals and transfer the data to the on-board processing system. The OBSs record the returning acoustic signals internally for later analysis. The OBSs to be used will be deployed and most (~60) will be retrieved during the cruise, whereas ~25 will be left in place for one year to collect data in the ambient environment. In addition to the operations of the airgun array, a multibeam echosounder (MBES) and a subbottom profiler (SBP) will also be operated from the R/V *Langseth* continuously throughout the cruise. Seismic operations will be carried out for 16 days, with the balance of the cruise occupied in transit (~2 days) and in deployment and retrieval of OBSs (~25 days). Some minor deviation from these dates may be required, depending on logistics and weather.

One alternative to the proposed action would be to conduct the survey at an alternative time. Constraints for vessel operations and availability of equipment (including the vessel) and personnel would need to be considered for alternative cruise times. Limitations on scheduling the vessel include the additional research studies planned on the vessel for 2012 and beyond. Other research activities planned within the region also would need to be considered. Given the limited weather window for the operations due to typhoon season, and the fact that marine mammals and turtles are in the survey area throughout the year, altering the timing of the proposed project likely would result in few net benefits.

Another alternative to conducting the proposed activities would be the "No Action" alternative, i.e. do not issue an IHA and do not conduct the operations. If the planned research were not conducted, the "No Action" alternative would result in no disturbance to marine mammals attributable to the proposed activities, but geological data of considerable scientific value and relevance increasing our understanding of the Earths hydrologic cycle, plate tectonics, and regional earthquakes would not be acquired and the project objectives as described above would not be met. The "No Action" alternative would result in a lost opportunity to obtain important scientific data and knowledge relevant to a number of research fields and to society in general. The collaboration, involving institutions, investigators, students, and technicians, would be lost along with the collection of new data, interpretation these data, and introduction of new results into the greater scientific community and applicability of this data to other similar settings. Loss of NSF support often represents a significant negative impact to the academic infrastructure.

Summary of environmental consequences

The potential effects of sounds from airguns on marine species, mammals and turtles of particular concern, are described in detail in Attachment 1 (pages 38-64 and Appendices B-E) and might include one or more of the following: tolerance, masking of natural sounds, behavioral

disturbance, and at least in theory, temporary or permanent hearing impairment, or non-auditory physical or physiological effects. It is unlikely that the project would result in any cases of temporary or especially permanent hearing impairment, or any significant non-auditory physical or physiological effects. Some behavioral disturbance is expected, if animals are in the general area during seismic operations, but this would be localized, short-term, and involve limited numbers of animals.

The proposed activity will include a mitigation program to further minimize potential impacts on marine mammals that may be present during the conduct of the research to a level of insignificance. As detailed in Attachment 1 (pages 7-14; and 53) monitoring and mitigation measures will include: ramp ups; a minimum of one but typically two dedicated observers maintaining a visual watch during all daytime airgun operations; two observers for 30 minutes before and during ramp-ups during the day and at night; passive acoustic monitoring (PAM) during the day and night to complement visual monitoring (unless the system and back-up systems are damaged during operations); and, power downs (or if necessary shut downs) when mammals or turtles are detected in or about to enter designated exclusion zones. Also, special mitigation measures will be in place for North Pacific right whales. The fact that the 36-airgun array, as a result of its design, directs the majority of the energy downward, and less energy laterally, would also be an inherent mitigation measure, as is the relatively wide spacing of the airgun shots during OBS operations (up to ~150 meters or 58-73 seconds). With the planned monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and turtle that could be encountered would be expected to be limited to short-term, localized changes in behavior and distribution near the seismic vessel. At most, effects on marine mammals may be interpreted as falling within the U.S. Marine Mammal Protection Act (MMPA) definition of "Level B Harassment" for those species managed by the National Marine Fisheries Service. No long-term or significant effects would be expected on individual marine mammals, sea turtles, or the populations to which they belong or on their habitats.

A survey at an alternative time would result in few net benefits. Marine mammals and sea turtles are expected to be found throughout the proposed study area. Many cetaceans are widespread in the survey area throughout the year, and others (some baleen whales) are present in winter and possibly migrating through during spring and fall. Green and possibly hawksbill sea turtles nest in the CNMI (e.g., Tinian and Saipan) at the time of the survey, so nesting females would be near shore or on land far from the survey area. Migrating green and hawksbill turtles, and migrating or foraging leatherback turtles, could be encountered in the deep waters of the survey area at any time of year.

The "no action" alternative would remove the potential of the limited direct environmental consequences as described. However, it would preclude important scientific research from going forward that has distinct potential to address environmental and geological processes/concerns.

Conclusions

NSF has reviewed and concurs with the conclusions of the LGL report (Attachment 1) that implementation of the proposed activity will not have a significant impact on the environment. Consequently, implementation of the proposed activity does not have a significant impact on the environment within the meaning of the National Environmental Policy Act (NEPA) or Executive

Order 12114. An environmental impact statement will not be prepared. No further action is required for NSF compliance with Executive Order 12114. On behalf of NSF, I authorize the issuance of a Finding of No Significant Impact for the marine seismic survey proposed to be conducted on board the research vessel *Marcus G. Langseth* in the Pacific Ocean proximate to the Commonwealth of the Northern Mariana Islands in February – March 2012.

Bauke Houtman 23JAN2012

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