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DRAFT NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) ANALYSIS PURSUANT TO EXECUTIVE ORDER 12114

Marine Geophysical Survey by the R/V *Melville* in the South-Eastern Pacific Ocean, May 2012

OCE# 1130013
Principal Investigators/Institution: Dr. Anne Trehu, Oregon State University
Project Title: Collaborative Research: Post-seismic response updip of the Chilean megathrust earthquake of February 27, 2010

This constitutes draft environmental analysis prepared by the National Science Foundation (NSF) for a marine seismic survey proposed to be conducted in May 2012 on board the research vessel (R/V) *Melville* in the south-eastern Pacific Ocean off the coast of Chile. A significant portion of this analysis was based on an Environmental Assessment report entitled, "Environmental Assessment of a Marine Geophysical Survey by the R/V Melville in the Pacific Ocean off Central and South America, October-November 2010", prepared by LGL, Ltd environmental associates, on behalf of the National Science Foundation and Scripps Institution of Oceanography (SIO). The LGL report, which was prepared for a similar marine geophysical survey off of Central and South America, was updated to reflect the proposed survey objectives and survey site environment off of Maule, Chile, including marine species anticipated to be present and take estimates (Attachment 1). Analysis in Attachment 1 was used to inform the Division of Ocean Sciences (OCE) management of potential environmental impacts of the cruise. OCE has reviewed and concurs with the analysis findings. Accordingly, Attachment 1 is incorporated into this analysis by reference as if fully set forth herein.

Project Objectives and Context

The purpose of this project is to study the seafloor off of Maule, Chile to monitor the post-seismic response following a megathrust earthquake which occurred there on February 27, 2010. Study efforts propose to evaluate how the outer accretionary prism, where sediments are accreted onto the non-subducting tectonic plate at the convergent plate boundary, responds to the change in tectonic stress that resulted from slip of the subduction fault during the earthquake. In particular, scientists will monitor for seismic tremor and for low frequency earthquakes as well as for normal earthquakes in the study area and underlying subducting crust and for slow fluid flow out of the seafloor that can be modeled to derive volumetric strain in the underlying sediments. This research activity would complement a NSF sponsored cruise conducted by SIO to map bathymetry in the area one month after the earthquake and other subsequent international research activities.

This subduction zone setting is typical of numerous locations around the world, and the results of the proposed survey will have broad application. These are settings that generate the world's largest and most destructive earthquakes and tsunamis, and the results of this study will have broad implications for geohazards studies and societal benefit.

The project would be a collaborative research effort and would provide support to US scientists, technicians, graduate and undergraduate students, and other support personnel.

Summary of Proposed Action and Alternatives

The procedures to be used for the survey would be similar to those used during previous seismic surveys and would involve conventional seismic methodology. The proposed survey would take place in May 2012 within the Exclusive Economic Zones (EEZ) of Chile (See Attachment 1, Figure 1). The seismic survey would consist of approximately 1145 km of transect lines in water depths ranging from approximately 1000 meters to 5000 meters. During the survey, a two GI airgun array would be deployed from the R/V *Melville* as an energy source; it would be operated simultaneously, with a maximum discharge volume of 210 in^3. A towed hydrophone streamer would receive the returning acoustic signals and transfer the data to the on-board processing system. Additionally, ocean bottom seismometers (OBSs) would be deployed to detect the acoustic signal, process the data, and log it internally until the instrument is retrieved and the data is recovered. OBSs would remain on the seafloor for approximately one year to continue to collect data from the survey area. In addition to the airgun array, a multibeam echosounder (MBES) and a sub-bottom profiler (SBP) would be used continuously throughout the cruise. Seismic operations would be carried out for approximately 11 days. Some minor deviation from proposed cruise dates may be required, depending on logistics, weather conditions, and the need to repeat some lines if data quality were substandard.

One alternative to the proposed action would be to issue an IHA at an alternative time and conduct the survey at that 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.

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 geophysical data of considerable scientific value that would increase our understanding of ocean faults and geohazards such as megathrust 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 investigators, students, and technicians, would be lost along with the collection of new data, interpretation of 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, including mammals and turtles of particular concern, are described in detail in Attachment 1 (pages 38-71 and Appendices B-D) 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 nonauditory 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 would 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 7-12; and 54-55) monitoring and mitigation measures would include: minimum of one dedicated observer maintaining a visual watch during all daytime seismic operations; two observers 30 min before and during start ups (and when possible at other times); ramp ups; and shut downs when marine mammals or sea turtles are detected in or about to enter designated exclusion zones. The fact that the airguns, as a result of their design, direct the majority of the energy downward, and less energy laterally, would also be an inherent mitigation measure.

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. As described in Attachment 1, marine mammals and sea turtles are expected to be found throughout the proposed study area and throughout the time period during which the project may occur. A number of marine mammal species are year-round residents in the south-eastern Pacific Ocean, so altering the timing of the proposed project likely would result in no net benefits for those species. Baleen whales have been observed near the survey site between July-September and migrating baleen whales might be encountered during the May survey period, as individuals travel north for the austral winter. However, the peak in mysticete sightings during April-June south of the survey area suggests most baleen whales would still be south of the survey area during the proposed survey period.

The "no action" alternative would remove the potential for disturbance to marine mammals or sea turtles attributable to the proposed activities as described. It would however preclude important scientific research from going forward that has distinct potential to address geological processes of concern.

Conclusions
NSF has reviewed and concurs with the conclusions of Attachment 1 that implementation of the proposed activity will not have a significant impact on the environment.