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Geosciences Directorate  
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**DRAFT ENVIRONMENTAL ASSESSMENT  
PURSUANT TO THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA),  
42 U.S.C. 4321, *et seq.***

**Marine Seismic Survey in the Pacific Ocean off Southern California, 2012**

This constitutes a draft environmental assessment (Draft EA) by the National Science Foundation (NSF) for a marine seismic survey proposed to be conducted at a time between September and December 2012 on board the research vessel (R/V) *Marcus G. Langseth* in the Pacific Ocean off the coast of southern California within the Exclusive Economic Zone of the U.S. This Draft EA is based, in part, on an Environmental Assessment report prepared by Padre Associates, Inc., entitled, “Environmental Assessment of Marine Geophysical Surveys by the R/V *Marcus G. Langseth* for the Southern California Collaborative Offshore Geophysical Survey” (Attachment 1).

The conclusions from the report prepared by Padre Associates, Inc. were used to inform the Division of Ocean Sciences (OCE) management of potential environmental impacts of the proposed marine geophysical surveys. OCE has reviewed and concurs with the report’s findings. Accordingly, the report prepared by Padre Associates, Inc., is incorporated into this Draft EA by reference as if fully set forth herein.

**Project Objectives and Context**

Scripps Institution of Oceanography (Scripps) and Southern California Edison (SCE) have initiated a collaborative scientific research project, in response to that requirement, to acquire two dimensional (2D) deep seismic reflection data in order to better understand the deformational history offshore San Onofre, California. The research vessel (R/V) *Marcus G. Langseth*, operated by Columbia University’s Lamont-Doherty Earth Observatory (LDEO), and owned by the National Science Foundation, would be used to support an offshore marine geophysical survey. The survey would consist of deploying seismic sound sources off shore and land receivers at onshore and offshore locations to generate data that could be used to improve imaging of major geologic structures and fault zones in the vicinity of the San Onofre Nuclear Generating Station (SONGS). These seismic studies would provide additional insights of any relationships or connection between the known faults as well as enhance knowledge of offshore faults in proximity to the southern California Coast and SONGS. Data sets collected would be “open access”.

The proposed seismic surveys would:

- Comply with the requirements established by Assembly Bill 1632 and directives of the California Public Utilities Commission;

- Image geometry and architecture of the offshore fault systems at depth and determine if the faults can be imaged when encased in the Catalina Schist;
- Identify targets and focus area(s) for a possible subsequent 2013 3D geophysical survey;
- Evaluate relationship between deep and surficial geologic deformation associated with the compressional structures observed along the margin;
- Generate a velocity structure model of the underlying geologic material to assess areas of active faulting and strain accumulation. The velocity structure model also would refine the location of offshore earthquakes near SONGS;
- Augment the current regional seismic database for subsequent use and analysis through the provision of all data to the broader scientific and safety community; and
- Determine the need and scope for additional seismic survey data acquisition.

### **Summary of Proposed Action and Alternatives**

The procedures to be used for the surveys would be similar to those used during previous seismic surveys by LDEO and would use conventional seismic methodology. The proposed surveys would take place sometime between September and December 2012, mostly likely November, in the Pacific Ocean off the southern coast of California, in the Exclusive Economic Zone of the U.S. (See Attachment 1, Figure 1). The project duration would be approximately 30 days, with seismic surveys comprising approximately 17 of those days and the remaining days occupied in project preparation (e.g. equipment calibration/deployments/mobilization/demobilization); vessel transit; anticipated weather and/or ship maintenance delays. The seismic surveys would consist of approximately 2,200 km (1,367 mi) of survey transect lines and a total survey area of approximately 3,445 km<sup>2</sup> (1,330 mi<sup>2</sup>) in water from 50 meters (m) to over 1000 m (164 to over 3280 feet) deep. The surveys would involve the R/V *Marcus G. Langseth* as the source vessel which would deploy an array of 18 airguns with a total discharge volume of ~3300 in<sup>3</sup>. The marine receiving systems would consist of a 6 km hydrophone streamer, approximately 28 ocean bottom seismometers, and approximately 40 land-based seismometers. Two onshore receiver lines or wireless “strings” containing Sigma<sup>TM</sup> seismometer units (20 units per line) would be temporarily installed inland from the coast, each “string” spanning approximately 17 to 27.5 km (11 to 17 mi), extending roughly in the same contours as the offshore OBS units. As the airgun array is towed along the survey lines, the hydrophone streamer would receive the returning acoustic signals and transfer the data to the on-board processing system. Ocean Bottom seismometers and land-based seismometers would be deployed and recovered during the survey and would record the returning acoustic signals internally for later analysis (Attachment 1, Figure 2-1). The OBSs would be deployed and recovered by the R/V *Sproul*. Consistent with the “Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey”<sup>1</sup> (PEIS), for high energy seismic surveys (HESS) where take is anticipated, the full mitigation zone (or safety zone) and mitigation zone (exclusion zone) were modeled for the proposed survey.

<sup>1</sup>Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey (June 2011) and NSF Record of Decision (June 2012). Available on the NSF Website: <http://www.nsf.gov/geo/oce/envcomp/index.jsp>.

In addition to the operations of the airgun array, a multibeam echosounder (MBES) and a subbottom profiler (SBP) would also be operated from the R/V *Langseth* continuously throughout the survey.

Timing of the survey would depend on logistics, weather, and issuance of authorization and permits, but is proposed to occur between September and December, most likely starting mid-November.

In addition to the proposed action Alternative, three Alternatives to the proposed action, including the No Action Alternative were considered (See Table 1). Three additional Alternatives were considered but were eliminated from further analysis as they did not meet the purpose of and need for the proposed action.

<b>Alternatives Considered</b>	<b>Description/Analysis</b>
<b>Alternative 1 -- No Action Alternative</b>	Under this alternative, no seismic surveys would be conducted and Scripps would rely on existing information and additional desktop analyses. While this alternative would avoid impacts to marine resources, it would not meet the objectives of the Project because it does not collect additional data associated with regionalized faulting as requested under California Assembly Bill 1632. Geological data of considerable scientific value and relevance increasing our understanding of the seismic hazards along the California coast would not be collected. The collaboration, involving industry, academic scientists, 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.
<b>Alternative 2 – Alternative Survey Timing</b>	Under this alternative, Scripps would conduct survey operations at a different time of the year to reduce impacts on marine resources and users, and improve monitoring capabilities. However, the proposed Project was selected, in part, because it would have the least impact on marine resources including seasonal concentrations of marine mammals, avian

	breeding, and the timing of California gray whale southward migration to breeding lagoons. 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.
<b>Alternative 3 – Restrict Survey to Daytime Operations</b>	Under this alternative, Scripps would only conduct seismic surveys during daylight hours when protected species would be easier to detect and, as such, accommodate the more expeditious initiation of the impact avoidance and minimization measures. However, restricting survey operations to daylight only would increase the actual number of days of surveys and could extend the duration of the Project into the period of the southward California gray whale migration.
<b>Alternatives Eliminated from Further Analysis:</b>	<b>Description</b>
<b>Alternative 4 -- Alternative Location</b>	Because of the location of SONGS and attendant geological features under investigation, alternative locations would not address the issues related to regional faulting.
<b>Alternative 5 -- Different Survey Techniques</b>	Under this alternative, Scripps would utilize alternative survey techniques, such as marine magnetotelluric or controlled source electromagnetic surveys that could reduce impacts on marine species. This alternative would not meet the objectives of the Project because it is experimental at this stage and, based on previous results from studies in the area, does not provide the necessary resolution to image the area faulting.
<b>Alternative 6 -- Survey Optimization</b>	Under this alternative, Scripps would alter airgun/streamer configurations, source/receiver characteristics, or other parameters to reduce the time and/or intensity of the survey in the

	<p>Project area. This alternative would not meet Project objectives because the proposed Project has been carefully designed and modifications to equipment and/or procedures could compromise results. Further, the proposed Project is consistent with other surveys conducted by the R/V Langseth and is, in fact, lower energy than other potential source and streamer configurations considered.</p>
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**Table 1.** Alternatives considered, eliminated from further analysis, and descriptions/analysis.

**Summary of environmental consequences**

The potential effects of the proposed action on marine and terrestrial species, including mammals and turtles of particular concern, are described in Attachment 1 (pages 75-118 and Appendices A-D). Potential impacts on marine species are consistent with those described in the PEIS, 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 proposed action 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 action, and Alternatives, would include a monitoring and mitigation plan, also called “a Marine Wildlife Contingency Plan,” (MWCP) to further minimize potential impacts on species that may be present during the conduct of the research to a level of insignificance. The monitoring and mitigation plan would include standard measures for marine species identified in the PEIS for HESS, and due to the proposed location of the surveys and associated compliance with California state requirements, would include additional measures. These monitoring and mitigation measures for marine species, both the standard and additional measures, are detailed in Attachment 1, Table 2-6, and pages 21-31. Monitoring and mitigation measures for marine species would include such activities as: ramp ups; dedicated protected species observers (PSOs) for maintaining a visual watch, including during ramp-ups; passive acoustic monitoring (PAM); power downs and shut downs; and aerial surveys. Monitoring and mitigation measures for terrestrial species are described in Attachment 1, pages 31. LDEO and SCE would prepare and implement the MWCP to reflect these monitoring and mitigation measures and any further ones resulting from federal and state requirements, such as those resulting from consultation with National Oceanic and Atmospheric Administration’s National Marine Fisheries Service (NOAA Fisheries) and US Fish and Wildlife Service pursuant to the Endangered Species Act and/or Marine Mammal Protection Act (MMPA), or the California Coastal Commission.

With the planned monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and sea turtles 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 MMPA definition of “Level

B Harassment” for those species managed by NOAA Fisheries. No long-term or significant effects would be expected on individual marine mammals, sea turtles, seabirds or the populations to which they belong or on their habitats.

Essential Fish Habitat (EFH) would be located within the survey area and Habitat Areas of Particular Concern (HAPC) could be found within the survey area and influenced by project activities. Project activities would not result in any chronic or permanent negative effects to EFH. The seismic component of the proposed project would have little impact on fish resources, and the only effect on fish habitat would be short term disturbance that could lead to temporary relocation of pelagic fish species or their food.

### **Conclusions**

NSF has reviewed and concurs with the conclusions of the Environmental Assessment report prepared by Padre Associates, Inc. (Attachment 1) that implementation of the proposed activity will not have a significant impact on the environment.