

**National Science Foundation  
Geosciences Directorate  
Division of Ocean Sciences  
Arlington, Virginia**

**FINDING OF NO SIGNIFICANT IMPACT (FONSI)  
PURSUANT TO THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA),  
42 U.S.C. 4321, *et seq.*  
and DECISION DOCUMENT**

**Marine Geophysical Survey by the R/V *Roger Revelle* in the Northeastern Pacific Ocean,  
September 2017**

**OCE 1714168**

**Principal Investigator/Institution:** Masako Tominaga, Texas A&M University  
**Co - Principal Investigator/Institution:** Greg Mountain, Rutgers University  
**Project Title:** Collaborative EAGER project: Early Career Seismic Chief Scientist Training Cruise

**OCE 1714413**

**Principal Investigator/Institution:** Anne Trehu, Oregon State University  
**Co - Principal Investigator/Institution:** Mitch Lyle, Oregon State University  
**Project Title:** Collaborative EAGER project: Early Career Seismic Chief Scientist Training Cruise

A Final Environmental Assessment (Final EA) was prepared for the proposed research and training project funded by the National Science Foundation (NSF) entitled, “Early Career Seismic Chief Scientist Training Cruise” (Proposed Action). The Principal Investigator (PI) is Dr. Masako Tominaga (Texas A&M University) and Co-PI is Drs. Greg Mountain (Rutgers University); the collaborating PIs/Co-PIs are Anne Trehu and Mitch Lyle (University of Texas at Austin). The Proposed Action includes a marine geophysical survey (or “seismic survey”) to be conducted on board Research Vessel *Roger Revelle* (R/V *Revelle*) in the Northeastern Pacific Ocean. R/V *Revelle* is owned by the United States (U.S.) Navy and is operated by Scripps Institution of Oceanography of the University of California San Diego (SIO).

The Final EA entitled, “Environmental Assessment of a Low-Energy Marine Geophysical Survey by the R/V *Roger Revelle* in the Northeastern Pacific Ocean, September 2017” (Report #FA0114-2) (Attachment 1), was prepared by LGL Limited environmental research associates (LGL) on behalf of NSF and analyzed the potential impacts on the human and natural environment associated with the proposed research activity pursuant to the National Environmental Policy Act 42 U.S.C. 4321, *et seq.* (NEPA). The Final EA tiers to 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 (June 2011) and the Record of Decision (June 2012) (jointly referred to as PEIS). The Final EA also incorporates by reference the analyses and conclusions set forth in the Final Environmental Assessment, Incidental Harassment Authorization (IHA), and the Biological Opinion (BiOp)/Incidental Take Statement (ITS) issued by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) for this Proposed Action. The conclusions from the Final EA were consistent with the conclusions of the PEIS and were used to inform the Division of Ocean Sciences (OCE) management of potential environmental impacts of the survey. OCE has reviewed and concurs with the Final EA findings. The Final EA is incorporated into this Finding of No Significant Impact (FONSI) and Decision Document by reference as if fully set forth herein.

### **Project Objectives and Context**

The purpose of the Proposed Action is to train scientists on how to effectively plan seismic surveys, acquire data, and manage activities at sea, and to improve the understanding the sediment and crustal structure within the Cascadia continental margin. During the cruise, high-resolution multi-channel seismic (MCS) profiles would be collected off the coast of Oregon and Washington in the northeastern Pacific (Attachment 1, Figure 1). The survey region is on the active continental margin of the west coast of the U.S., where a variety of sedimentary and tectonic settings are available, which would provide many targets of geologic interest to participating researchers. In addition to a training cruise and providing a critical data set for understanding the Cascadia margin, the data collected during the survey would support NSF's need to foster a better understanding of Earth processes. The Proposed Action has been identified as an NSF program priority and would support U.S. scientists and graduate students.

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

The procedures of the Proposed Action would be similar to those used during previous seismic surveys and would use conventional seismic methodology. Two potential survey sites off the Oregon continental margin have been proposed, and are depicted by the boxes in Attachment 1, Figure 1. One survey option (Astoria Fan) is located off northern Oregon off the mouth of the Columbia River and near the Astoria Canyon; the other (southern Oregon) is located off the southern Oregon margin. Each of the proposed surveys has several potential science targets.

During the seismic surveys, a pair of low-energy Generator-Injector airguns with a total discharge volume of approximately 90 cubic inches would be used for approximately 5 days (total vessel operations would last approximately 8 days including transit, equipment maintenance, etc.). Some deviation in the length of the survey may be required, depending on logistics and weather; however, seismic operations would only occur during the timeframe allowable under the IHA. The seismic surveys would take place in water depths 130–2600 meters, within the U.S. Exclusive Economic Zone (EEZ), but outside of state and territorial waters. The receiving system for the returning acoustic signals would be a towed hydrophone streamer, approximately 800 meters in length. No equipment would be placed on the seafloor during the Proposed Action. The survey would consist of approximately 1057 km of transect lines. As the airgun array is towed along the survey lines, the hydrophone streamer would receive the returning acoustic signals; the hydrophone streamer would transfer the data to the on-board processing system. In addition to the operations of the airgun array, a multibeam

echosounder (MBES) and sub-bottom profiler (SBP) are proposed to be operated from the R/V *Revelle*.

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. Additionally, other constraints, such as presence of marine species and weather are other factors for consideration in survey timing. Limitations on scheduling the vessel include the additional research studies planned on the vessel for 2017 and beyond. Other activities planned within the region also would need to be considered if the survey was scheduled for an alternative time.

Another alternative to conducting the Proposed Action would be the “No Action” alternative (i.e. do not request that an IHA be issued, and do not allow the proposed research operations to be conducted). The “No Action” alternative would result in no disturbance to marine species attributable to the Proposed Action, but early career scientists would not be trained and geological data of considerable scientific value and relevance increasing our understanding of the earthquake hazards and paleoclimate records in basins off the Oregon continental margin would not be collected.

#### **Summary of environmental consequences**

The Final EA includes analysis on the affected environment (Chapter III) and the potential effects of the Proposed Action on the environment (Chapter IV). Potential impacts of the Proposed Action on the environment would be primarily a result of the operation of the airgun array. The potential effects of sounds from airguns on marine species, mammals, and sea turtles of particular concern, are described in detail in Attachment 1 (Chapter IV and PEIS Chapters 3 & 4) 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 potential effects from the other proposed acoustic sources were also considered, however, they would not be likely to have a significant effect on the environment (Attachment 1, Chapter IV; and PEIS Sections 3.4.7, 3.6.7, and 3.7.7).

The Proposed Action includes an extensive monitoring and mitigation program to further minimize potential impacts on the environment. Mitigation efforts include pre-cruise planning activities and operational activities (Attachment 1, Chapters II and IV; and PEIS 2.4.1.1). Pre-cruise planning mitigation activities included consideration of energy source optimization/minimization; survey timing (i.e., environmental conditions: seasonal presence of animals and weather); and calculation of mitigation zones. The operational mitigation program would further minimize potential impacts to marine species that may be present during the conduct of the proposed research to a level of insignificance. As detailed in Attachment 1 (Chapters II and IV), per the IHA and ITS issued by NMFS on 22 September 2017, operational monitoring and mitigation measures would include: ramp ups; typically two (minimally one) 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; and, power downs (or, if necessary, shut downs) when marine mammals, sea turtles, and endangered seabirds are detected in or are about to enter designated exclusion zones. Additional mitigation measures per the IHA and ITS would be followed, including monitoring a 200-m buffer zone and shut downs for non-traveling aggregations of large whales (i.e., baleen and/or sperm whales), large whale with a calf, and killer whales and North Pacific Right whales observed at any distance. Per the IHA and ITS, seismic operations would not need to cease for bow-riding small delphinoids. The fact that the small 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.

With the planned monitoring and mitigation measures, unavoidable impacts to marine species that could be encountered would be expected to be minimal, and 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 federal Marine Mammal Protection Act (MMPA) definition of “Level B Harassment” for those species managed by NMFS, however, NMFS also issued small numbers of Level A take for some marine mammal species for the remote possibility of low-level physiological effects from the Proposed Action. Although considered unlikely, NMFS noted that any Level A harassment potentially incurred would be expected to be in the form of some smaller degree of permanent hearing because of the constant movement of both the R/V *Revelle* and of the marine mammals in the project area, as well as the fact that the vessel is not expected to remain in any one area in which individual marine mammals would be expected to concentrate for an extended period of time (Attachment 1, Appendix B). According to NMFS, neither mortality nor complete deafness of marine mammals is expected to result from the survey (Attachment 1, Appendix B). No long-term or significant effects would be expected on individual marine mammals, sea turtles, seabirds, fish or the populations to which they belong or on their habitats.

The results of the cumulative impacts analysis in the PEIS indicated that there would not be any significant cumulative effects to marine resources from the proposed NSF-funded marine seismic research, including the combined use of airguns, MBES, SBP, and acoustic pingers. However, the PEIS also stated that, cruise-specific cumulative effects analysis would be conducted, “allowing for the identification of other potential activities in the area of the proposed seismic survey that may result in cumulative impacts to environmental resources.” The Final EA evaluated potential cumulative effects of the Proposed Action. Due to the location of the Proposed Action, human activities in the area around the survey vessel could include other academic and industry research activities, fisheries activities, military, tourism, and other vessel traffic. These activities that could occur within the region and potential impacts to them from the Proposed Action are described in further detail in the Final EA, Chapters III and IV. Fisheries activities would not be precluded in the survey areas; however, a safe distance would need to be kept to avoid possible entanglement with the towed airgun array. No fish kills or injuries were observed during any previous NSF-funded seismic survey activities. Given the very short duration of the proposed survey and the temporary nature of potential environmental impacts, no cumulative effects, or economic impacts to other human activities in the area, including fisheries activities, would be anticipated.

Conducting the survey at an alternative time would result in few net benefits. Except for some baleen whales, most marine mammal species are probably year-round residents in the survey

area, so altering the timing of the proposed project likely would result in no net benefits for any species. Weather (i.e., operational safety of crew and vessel when deploying seismic gear) and availability of vessel, equipment, and personnel are also factors that need to be considered when scheduling the activity. There is a timeliness factor involved with the Proposed Action; the professional and academic careers of the researchers and students involved with the Proposed Action are affected by the opportunity to participate in the training cruise and there is a desire to have the scientific data collected and results incorporated into the broader scientific community in the near term.

The “No Action” alternative would remove the potential of the limited direct and indirect environmental consequences as described. However, it would preclude the training opportunity of early career scientists and scientific research from going forward. The collaboration, involving PIs and early career scientists, would be lost along with the collection of new data, interpretation of these data, and introduction of new results into the greater scientific community. Loss of NSF support often represents a significant negative impact to the academic infrastructure, including the professional and academic careers of the researchers, students, ship technicians and crew who are part of the U.S. Academic Research Fleet. The “No Action” alternative would not meet the purpose and need of the Proposed Action.

NSF posted the Draft EA on the NSF website for a 30-day public comment period; no comments were received. As the Draft EA included information regarding marine mammals and threatened and endangered species in the proposed survey areas, it was used for consultations with other regulatory agencies. NSF reviewed and considered public comments received by NMFS during a 30-day public comment period for the IHA process. After consideration of public comments received during the public comment period and discussions during MMPA and Endangered Species Act (ESA) consultations with NMFS, refinements to the information in the Draft EA were made, including to the acoustic modeling information and take calculations. The new information included in the Final EA, however, did not alter the overall conclusions of the Draft EA and remained consistent with the PEIS.

### **Coordination with Other Agencies and Processes**

#### *Endangered Species Act (ESA)*

NSF engaged in formal consultation with NMFS and informal consultation with U.S. Fish and Wildlife Service (USFWS), pursuant to Section 7 of the ESA. The Draft EA was used during the ESA Section 7 consultation process with NMFS and USFWS. On 11 May 2017, NSF submitted a letter of concurrence request to USFWS that the proposed activity may affect but was not likely to adversely affect the *endangered* short-tailed albatross and the *threatened* marbled murrelet and western snowy plover in the unlikely event the species was observed near survey operations. On 18 September 2017, USFWS provided a letter of concurrence (Attachment 1, Appendix E) that the proposed activity “may affect” but was not likely to “adversely affect” these species under their jurisdiction. Mitigation measures for these species would include power downs/shut downs for diving or foraging ESA-listed seabirds within the exclusion zone.

On 20 March 2017, NSF submitted a formal ESA Section 7 consultation request, including the Draft EA, to NMFS for the proposed activity. On 22 September 2017, NMFS issued a Biological Opinion and ITS for the proposed activity and the consultation was concluded (Attachment 1, Appendix C). NMFS concluded in the Biological Opinion that the proposed

survey was not likely to jeopardize the continued existence of endangered species and would have no effect on their critical habitat. SIO, NSF, TAMU, OSU, and Rutgers would adhere to the monitoring and mitigation requirements identified in the ITS.

*Marine Mammal Protection Act (MMPA)*

The Draft EA was also used as supporting documentation for an IHA application submitted on 22 March 2017 by SIO on behalf of itself, NSF, TAMU, OSU, and Rutgers, to NMFS, under the U.S. MMPA, for “taking by harassment” (disturbance) of small numbers of marine mammals during the proposed seismic survey. Discussions with NMFS about how to comply with new acoustic technical guidance<sup>1</sup>, however, began as early as November 2016. On 17 August 2017, NMFS issued in the Federal Register a notice of intent to issue an IHA for the survey and a 30-day public comment period. NMFS received public comments, which were summarized in their EA and will be made available on their website at <http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm#SIORevelle2017>. NSF reviewed and considered the comments submitted during the IHA process. NMFS prepared a separate Environmental Assessment (Attachment 1, Appendix A) for its federal action of issuing an IHA; NMFS’ Environmental Assessment is incorporated by reference in this Final EA as appropriate and where indicated. NMFS issued an IHA on 22 September 2017 (Attachment 1, Appendix B) for the proposed activity. SIO, NSF, TAMU, OSU, and Rutgers will adhere to the IHA requirements.

*Magnuson-Stevens Fishery Conservation and Management Act - Essential Fish Habitat (EFH)*

Although NSF anticipated no significant impacts to EFH and HAPC, as the proposed activities may affect EFH and HAPC, in accordance with the Magnuson-Stevens Fishery Conservation and Management Act NSF requested consultation with NMFS on 11 May 2017. In a letter dated 11 August, 2017, NMFS concluded that the Proposed Action would result in some level of adverse effects on EFH, but that much of the research available to date on the effects of seismic survey methods and how to minimize and mitigate those effects have been focused on marine mammals and not fish and benthic invertebrates (Attachment 1, Appendix D). Therefore, NMFS offered the following single EFH conservation recommendation pursuant to section 305(b) of the MSA, “Additional research and monitoring should be undertaken to gain a better understanding of the potential effects these seismic surveys may have on EFH, federally managed species, their prey and other NMFS trust resources. This research should be a component of future NSF funded seismic survey activities. This will aid in the development of site and project specific EFH conservation recommendations for future projects as appropriate.” In a letter dated 12 September 2017, NSF accepted the EFH conservation recommendation, agreeing to consider for future activities additional research and monitoring measures that could be undertaken to gain a better understanding of the potential effects seismic surveys may have on EFH, federally managed species, their prey and other NMFS trust resources.

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<sup>1</sup> Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commerce, NOAA. 178 p. 2016.

*Coastal Zone Management Act*

On 8 May 2017, NSF submitted Negative Determinations pursuant to Part 930 Subpart C of the CZMA to the states of Oregon and Washington (Attachment 1, Appendix F). On 8 May 2017, the Oregon Coastal Management Program concurred with the Negative Determination (Attachment 1, Appendix F). No response or request for an extension was received by NSF from Washington state; per CZMA Subpart C 930.35(c), since no response was received within 60 days, state concurrence was presumed.

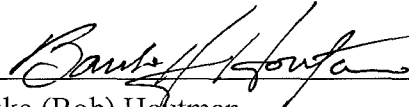
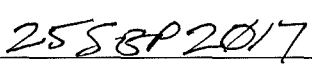
**Conclusion and Decision**

NSF has reviewed and concurs with the conclusions of the Final EA (Attachment 1) that that implementation of the Proposed Action will not have a significant impact on the environment. Consequently, implementation of the Proposed Action will not have a significant direct, indirect or cumulative impact on the environment within the meaning of the National Environmental Policy Act (NEPA). Because no significant environmental impacts will result from implementing the Proposed Action, an environmental impact statement is not required and will not be prepared. Therefore, no further study under NEPA is required.

As described above, NSF's compliance with the Marine Mammal Protection Act, Endangered Species Act, Essential Fish Habitat under the Magnuson-Stevens Act, and Coastal Zone Management Act has been completed.

Accordingly, on behalf of NSF, I authorize the issuance of a Finding of No Significant Impact for the Proposed Activity, the marine seismic survey proposed to be conducted on board the Research Vessel *Roger Revelle* in the Northeastern Pacific Ocean, during the effective time period of the IHA and hereby approve the Proposed Action to commence.

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Bauke (Bob) Houtman Date  
Integrative Programs Section Head  
Division of Ocean Sciences

Attachment 1: Environmental Assessment of a Low-Energy Marine Geophysical Survey by the R/V *Roger Revelle* in the Northeastern Pacific Ocean, September 2017