National Science Foundation
Geosciences Directorate
Division of Ocean Sciences
Alexandria, Virginia

FINDING OF NO SIGNIFICANT IMPACT (FONSI) PURSUANT TO THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) AND DECISION DOCUMENT (DD)

Marine Geophysical Survey along the Aleutian Arc, 2020

Award: OCE 1753704
Principal Investigator/Institution: Daniel Lizarralde, Woods Hole Oceanographic Institution (WHOI)

Award: OCE 1753676
Co-Principal Investigator/Institution: Donna Shillington, Northern Arizona University/Columbia University Lamont-Doherty Earth Observatory (LDEO)

Project Title: Collaborative Research: A Seismic Study of Oceanic-Arc Crustal Construction Processes at the Archetypal Andreanof Segment of the Aleutian Arc

A Final Environmental Assessment (Final EA) was prepared for the proposed research project funded by the National Science Foundation (NSF) entitled, "A Seismic Study of Oceanic-Arc Crustal Construction Processes at the Archetypal Andreanof Segment of the Aleutian Arc" (Proposed Action). The Proposed Action would involve a marine geophysical survey (or "seismic survey") to be conducted on board Research Vessel *Marcus G. Langseth* (R/V *Langseth*) along and across the Aleutian Andreanof Arc in Alaska during September–October 2020. R/V *Langseth* is owned by NSF and operated on its behalf through a Cooperative Agreement entered in 2018 with Columbia University Lamont-Doherty Earth Observatory (LDEO). The Proposed Action would involve the Principal Investigators (PI), Drs. Daniel Lizarralde, Woods Hole Oceanographic Institution (WHOI), and Donna Shillington, Northern Arizona University/LDEO (referred to herein as the "Proposing Institutions").

The Final EA entitled, "Final Environmental Assessment of a Marine Geophysical Survey by R/V *Marcus G. Langseth* of the Aleutian Arc, September–October 2020" (Report # FA0202-01) (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 Action pursuant to the National Environmental Policy Act (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 herein as the PEIS). This Finding of No Significant Impact/Decision Document (FONSI/DD) also incorporates by reference the analyses and conclusions set forth in the 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, and other federal regulatory processes, 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 FONSI/DD by reference as if fully set forth herein.

Project Objectives and Context

The primary goal of the survey is to seismically image the structure of the crust along and across the Andreanof segment of the Aleutian Arc, an intact arc segment with a simple and well known history. To achieve the project goal, the researchers propose to conduct a 2D seismic survey using R/V *Langseth* along the Aleutian Andreanof Arc to collect a wide-angle reflection/refraction dataset. The proposed survey is illustrated with representative tracklines in the Final EA (Attachment 1, Figure 1).

Summary of Proposed Action and Alternatives

The procedures of the Proposed Action would be similar to those used during previous 2-D seismic surveys and would use conventional seismic methodology. The survey would involve one source vessel, R/V *Langseth*. R/V *Langseth* would tow an array of 36 or 18 airguns at a depth of 9 meters (m) as an energy source with a total volume of approximately (~) 6600 or 3300 inches cubed (in^3). The receiving system would consist of a towed multichannel hydrophone streamer and ocean bottom seismometers (OBSs). As the airgun arrays are towed along the survey lines, a hydrophone streamer or the OBSs would receive the returning acoustic signals; OBSs would store the data internally for later analysis. In addition to the operations of the airgun array, a multibeam echosounder (MBES) and sub-bottom profiler (SBP) would be operated from R/V *Langseth* continuously throughout the cruise, but not during transit to the site. Representative tracklines shown in Figure 1 have a total length of ~3224 km. A total of 10% of this survey would use an 18-airgun array, and the remainder would employ the full 36-airgun array. There could be additional seismic operations associated with turns, airgun testing, and repeat coverage of any areas where initial data quality is sub-standard; 25% of additional effort was added to the proposed line km to account for these possibilities. During the survey, ~1% of the line km would take place in shallow water (<100 m), 26% would occur in intermediate water depths (100–1000 m), and the rest (73%) would occur in deep water (>1000 m).

The survey is expected to consist of ~16 days of seismic operations, 14 days of OBS and MCS equipment deployment/retrieval, 6 days of transits between seismic transects, 2 days of transiting to and from port, and 5 days of contingency (e.g., weather, etc.). Some deviation in the length of the survey, and ports of call, may be required, depending on logistics and weather; however, seismic operations would only occur during the timeframe allowable under the IHA. Seasonality of the proposed survey operations does not affect the analysis (including take estimates), because the best available species densities for any time of the year were used.

Another alternative to conducting the Proposed Action would be the "No Action" alternative (i.e. the proposed research operations would not be conducted). The "No Action" alternative would result in no disturbance to marine species attributable to the Proposed Action, but geological data of considerable scientific value and relevance to increasing our understanding of the fundamental processes that form oceanic-arc crust would not be collected. The purpose and need for the proposed activity would not be met through the "No Action" alternative.

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 Chapter 3).

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 Section 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), the IHA and ITS issued by NMFS, and Letter of Concurrence (LOC) issued by USFWS, operational monitoring and mitigation measures would include: visual observations, acoustic monitoring, exclusion and buffer zones, pre-clearance and ramp ups, shutdowns and power downs, monitoring and reporting. The fact that the 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. The acoustic source would be shut down at any distance from the vessel during operations for observances of North Pacific right whales, any large whale with a calf, and aggregation of large whales (defined as 6 or more). The shutdown requirement would be waived for small dolphins of the following genera: *Lagenorhynchus* and *Lissodelphis*. Operations would also avoid exposing sea otters from ensonification levels of 160 dB re 1 µPa SPL or greater (Level B zone) to avoid take. The acoustic source would be powered or shut down in the event an ESA-listed seabird were observed diving or foraging within the designated exclusion zones. LDEO and its contractors are committed to applying these measures in order to minimize effects on marine mammals, sea turtles, seabirds, and fish, and other potential environmental impacts. PSOs would also watch for any impacts the acoustic sources may have on marine species, including seabirds and fish. NMFS included vessel strike avoidance measures in the IHA; however, as noted in the Final EA, R/V *Langseth* (and other vessels in the U.S. Academic Research Fleet) have no history of marine mammal strikes. Although NSF calculated predicted distances to the Level A thresholds based on current NMFS Technical Acoustic Guidance[1], per the IHA, NMFS established a fixed operational 500 m exclusion zone and 1,000 m buffer zone for the survey; the IHA also requires a 1,500m EZ for all beaked whales. The predicted distances for the Level B zones are based on the 160 dB re 1 µPa SPL isopleth, per current NMFS policy for Level B harassment.

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, any Level A harassment potentially incurred would be expected to be in the form of some smaller degree of permanent hearing loss due in part to the required monitoring measures for detecting marine mammals and required mitigation measures for power downs or shut downs of the airgun array if any animal is likely to enter the exclusion zones. Neither mortality nor complete deafness of marine mammals is expected to result from the survey. No long-term or significant effects would be expected on

[1] 2018 Revision to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (version 2.0). Underwater thresholds for onset of permanent and temporary threshold shifts. Office of Protected Resources, NMFS, Silver Spring, MD.

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 potential cumulative effects of the Proposed Action were evaluated in Section 4.1.8 of the Final EA. Due to the location of the Proposed Action and distance from shore, human activities in the area around the survey vessel would be anticipated to be limited to fishing, research activities, recreational scuba, vessel traffic, and subsistence hunting. Recreational SCUBA diving is a small industry in Alaska, and because the proposed survey would occur mainly in water deeper than 100m, recreational diving is unlikely to be impacted. Although some research activities have occurred in the past and some may occur in the future, including fisheries stock assessment surveys, no other known research activities are known to be currently proposed in the survey area. Fisheries activities within the region and potential impacts are described in further detail in the Final EA, Chapters III and IV. Fisheries activities would not be precluded in the survey area; 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 brief duration of the proposed survey and the temporary nature of potential environmental impacts, no cumulative effects, or economic impacts to fisheries, would be anticipated.

Subsistence is an important component of Alaska Native culture and community. The proposed project could potentially impact the availability of marine mammals for harvest in a small area immediately around R/V *Langseth*, and for a very short time period during seismic operations. Considering the limited time that the planned seismic survey would take place close to shore, where most subsistence harvest of marine mammals occurs, and brief period of operations, the proposed project is not expected to have any significant impacts to the availability of Steller sea lions, harbor seals, or sea otters for subsistence harvest. The potential to negatively impact subsistence hunting would be minimized through outreach and avoidance during the survey. In response to our outreach efforts, the Aleut Marine Mammal Commission noted they had no issues with the survey. After review, the combined effects of the project and other potential human activities in the area are not anticipated to result in significant impacts on the environment.

The "No Action" alternative would remove the potential of the limited direct and indirect environmental consequences as described. However, it would preclude important scientific research from going forward that would contribute to our understanding of the architecture of oceanic-arc crust, to infer processes that control chemical fractionation and lead to the creation of continent-like compositions, and that would add to the comprehensive assessment of geohazards for the Alaska region, such as earthquake and tsunami hazards. The "No Action" alternative would result in a lost opportunity to obtain important scientific data and knowledge relevant to the geosciences and to society in general. The collaboration, involving PIs and students, 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 a Draft Environmental Assessment (Draft EA) on the NSF website for a 30-day public comment period from 29 June thru 28 July 2020. NSF sent notices about the availability of the Draft EA to potential interested parties (e.g., regional commissions, fisheries organizations, etc.). Comments were received from three entities (i.e., Groundfish Forum, Aleutian King Crab Research Foundation, NMFS Alaska Region Habitat Conservation Division) and are addressed in the Final EA Appendix E. In summary, concerns raised regarding the project were mainly focused on potential space/use conflicts and impacts on fish and

catch rates. Survey tracklines and OBS deployments were adjusted to entirely avoid Aleutian Islands Coral Habitat Protection Areas (AICHPA), a protected area highlighted by one of the commenters. A significant portion of the proposed survey would occur outside of viable fishing areas, reducing the chance for time/space overlap. Given the seismic survey portion of the Proposed Action would only take approximately 16 days, the chance for interaction with fishing vessels would be limited further. R/V *Langseth* would move continuously during the survey, making two passes along the proposed survey tracks, spending approximately 2 hours in any particular area at a time, and 4 hours in total. For those areas where there could be overlap with fishing vessels, the vessel operator would work to avoid time/space overlap through direct communication with fishermen in the area.

As the Draft EA included information regarding marine mammals and threatened and endangered species in the proposed survey area, it was used for consultations with other regulatory agencies. As part of the IHA process, NMFS posted a Notice of Intent to issue an IHA in the Federal Register with a 30-day public comment period. After discussions with federal regulators during MMPA and Endangered Species Act (ESA) processes, some refinements to the information in the Draft EA and planned operations were made, including reduced source volume in some areas, adjusted tracklines to avoid Steller Sea Lion major haulouts, and revisions to take estimates. 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.

On 23 April 2020, NSF requested informal consultation under ESA Section 7 for the Proposed Action with USFWS as endangered and threatened species under USFWS jurisdiction could occur within the survey area, including seabirds (Attachment 1, Section 3.5): short-tailed Albatross (*Phoebastria albatrus*; Attachment 1, Section 3.5.1), Steller's eider (*Polysticta stelleri*; Attachment 1, Section 3.5.2), and Speckled eider (Somateria fischeri; Attachment 1, Section 3.5.3). As originally designed, the Proposed Action had the potential for take of northern sea otter (Enhydra lutris; Attachment 1, Section 3.3.4) and overlap with sea otter critical habitat (Attachment 1, Section 3.2.1.3). After initial consultation discussions with USFWS, however, the Proposed Action was modified to avoid sea otter critical habitat and sea otter take. On 11 June 2020, the consultation request was modified to include the Southwest DPS of northern sea otter and their critical habitat. On 26 June 2020, USFWS provided a letter of concurrence (Attachment 1, Appendix F) that the proposed project activities were not likely to adversely affect any listed species or their designated critical habitat under their jurisdiction.

On 27 March 2020, NSF submitted a formal ESA Section 7 consultation request, including the Draft EA, to NMFS for the proposed activity. NSF and NMFS staff held biweekly meetings to discuss the Proposed Action and matters related to the consultation. NMFS issued a Biological Opinion and an Incidental Take Statement (Attachment 2) for the Proposed Action on 1 September 2020, and consultation was concluded.

Marine Mammal Protection Act (MMPA)

On 27 March 2020, LDEO submitted on behalf of NSF, LDEO, and the Proposing Institutions to NMFS an IHA application pursuant to the MMPA. NSF and NMFS staff held biweekly meetings to discuss the Proposed Action and matters related to the IHA application. Following a 30-day public comment period, NMFS considered public comments received and issued an IHA (Attachment 3) on 1 September 2020.

On 10 April 2020, NSF submitted an IHA application to USFWS pursuant to the MMPA for potential sea otter take and overlap with sea otter critical habitat. After initial discussions with USFWS, however, the Proposed Action was modified to avoid sea otter take. Specifically, operations would avoid exposing sea

otters from ensonification levels of 160 dB re 1 µPa SPL or greater (Level B zone) to avoid take. As no take was anticipated, an IHA for sea otter take was determined unnecessary and the IHA application was withdrawn.

Essential Fish Habitat (EFH)
EFH was identified to occur within the proposed survey area, but HAPCs would be greater than 100 km away. Although NSF anticipated no adverse impacts to EFH and HAPC, in accordance with the Magnuson-Stevens Fishery Conservation and Management Act, NSF requested consultation with NMFS on 5 June 2020. On 30 July 2020, NOAA noted in response that they had "no issues with the survey as documented". As such, NMFS did not provide additional conservation recommendations for Proposed Action, thus satisfying the requirements of both sections 305(b)(2)(A) and sections 305(b)(2)(B) of the Magnuson-Stevens Act.

Conclusion and Decision
NSF has reviewed and concurs with the conclusions of the Final EA (Attachment 1) 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 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 MMPA, ESA, and EFH is completed.

In sum, after full consideration of the Final EA, the PEIS, the IHA and ITS issued by NMFS, the letter of concurrence from USFWS, the EFH conclusion, and the entire environmental compliance record, NSF concludes that implementation of the Proposed Action will not result in significant impacts. Accordingly, on behalf of NSF, I authorize the issuance of a Finding of No Significant Impact for the Proposed Action, the marine seismic survey proposed to be conducted on board Research Vessel *Marcus G. Langseth* along the Aleutian Arc during the effective time period of the IHA, and hereby approve the Proposed Action to commence.

Bauke (Bob) Houtman *Bauke Houtman* Date 1 September 2020
Integrative Programs Section Head
Division of Ocean Sciences

Attachment 1: Final Environmental Assessment of a Marine Geophysical Survey by R/V *Marcus G. Langseth* of the Aleutian Arc, September–October 2020
Attachment 2: Biological Opinion/Incidental Take Statement
Attachment 3: Incidental Harassment Authorization