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 Surveys by R/V *Marcus G. Langseth* of the Cascadia Subduction Zone in the Northeast Pacific Ocean, 2022

Award: OCE 2034896
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Award: OCE 2034872
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Project Title: Collaborative Research: Quantifying the thermal effects of fluid circulation in oceanic crust entering the Cascadia subduction zone

A Final Environmental Assessment (Final EA) was prepared for the above noted proposed research project funded by the National Science Foundation (NSF) (Proposed Action). The Proposed Action would involve marine geophysical surveys (or "seismic surveys") and use of a heat probe in the Northeast Pacific Ocean within the U.S. Exclusive Economic Zone (EEZ) in summer 2022. R/V *Langseth* is owned and operated by Columbia University's Lamont-Doherty Earth Observatory (LDEO). The Proposed Action would involve the Principal Investigators (PI) noted above and referred to herein as the "Proposing Institutions".

The Final EA entitled, "*Final Environmental Assessment of Marine Geophysical Surveys by R/V Marcus G. Langseth of the Cascadia Subduction Zone in the Northeast Pacific Ocean, 2022*" (Attachment 1) 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 Final EA and issued Finding of No Significant Impact (FONSI) for seismic surveys that occurred in the region in 2021, with updates to the project information and data as appropriate. All federal authorizations were issued for the 2021 activity, including incidental harassment authorizations (IHAs) and Biological Opinions (BiOps). This EA also tiers to the EA of Marine Geophysical Surveys by the R/V *Marcus G. Langseth* in the Northeastern Pacific Ocean, June–July 2012 and issued FONSI for similar seismic surveys conducted in 2012 in, or near, the proposed survey area; and, it 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 Record of Decision (June 2012), referred to herein as PEIS. This Finding of No Significant Impact/Decision Document (FONSI/DD) also incorporates by reference the analyses and conclusions set forth in the IHA and BiOp/Incidental Take Statement (ITS) issued by the U.S. 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 surveys. 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 goals of the seismic surveys are to improve understanding of the thermal structure of the Juan de Fuca plate as it enters the Cascadia subduction zone. To achieve the project goals, the researchers propose to utilize 2-D multi-channel seismic (MCS) reflection capabilities of R/V *Langseth* and a heat probe. The proposed surveys would occur in water depths greater than 1600 meters (m) and are illustrated 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 surveys would involve one source vessel, R/V *Langseth*, which would tow a two-GI airgun cluster with a discharge volume maximum of 90 cubic inches (in^3) at a depth of 2-4 m. The receiving system would consist of an 800–1400 m long hydrophone streamer. As the airgun array is towed along the survey lines, the hydrophone streamer would receive the returning acoustic signals. 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.

A heat probe would also be deployed from R/V *Langseth*. The probe would be lowered into the seafloor sediment, penetrating up to 6 m into the sediment. The heat flow measurements along a transect would be acquired in "pogo" mode, in which the probe is left in the water between sites on a particular transect as the ship slowly moves from site to site along the transect. The heat probe is a passive system that takes the temperature of the sediments like a thermometer.

The proposed surveys are scheduled for summer 2022 and would be expected to last for ~23 days, including ~6 days of seismic operations, 3 days of transit, and 14 days of heat flow measurements. R/V *Langseth* would likely leave out of and return to port in Newport, OR. Some deviation in the duration of the surveys and ports of call may be required, depending on logistics, weather, COVID-19, etc.; however, research operations would only occur in the area noted and timeframe allowable under the IHA and other relevant documentation.

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 scientific value and relevance increasing our understanding of the Cascadia Subduction Zone, geohazards, and heat flow processes 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, including 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 BiOp/ITS issued by NMFS, the Proposed Action would include operational monitoring and mitigation measures, such as, but not limited to: visual observations; enforcement of exclusion and buffer zones; pre-clearance and ramp ups, shutdowns and power downs of the airguns; 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. In the Final EA, it was noted that the acoustic source would be shut down for any large whale with a calf and aggregation of large whales (defined as 6 or more) observed at any distance from the vessel during operations. In the IHA, however, rather than a shutdown, NMFS required an extended 500-m EZ to be established during survey effort for beaked whales, dwarf and pygmy sperm whales, killer whales, a large whale with a calf, and groups of 6 or more large whales. During operations, the IHA requirement (extended 500-m EZ) will be followed. The shutdown requirement would be waived for small dolphins including Delphinus, Lissodelphis, and Stenella. The acoustic source would also be powered down (or, if necessary, shut down) in the event Endangered Species Act (ESA)-listed sea turtles and seabirds (diving/foraging) were observed within the designated exclusion zone (EZ). Observers (and vessel crew) would monitor for any impacts the acoustic sources may have on fish. LDEO and its contractors are committed to applying these measures in order to minimize any effects on marine mammals, sea turtles, seabirds, and fish, and other potential environmental impacts.

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. Per the IHA, NMFS established a fixed operational 100 m exclusion zone and 100 m buffer zone for the surveys, and an extended EZ of 500 m as noted previously for other species/conditions. The predicted distances for the Level B zones are based on the 160 dB re 1 µPa SPL isopleth, per current NMFS approach on Level B harassment. Mitigation, monitoring and reporting requirements were incorporated into the Final EA, the FONSI/DD, and/or the LDEO Science Support Plan; PSOs would take the lead in ensuring compliance with all monitoring and mitigation measures.

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 U.S. Marine Mammal Protection Act (MMPA) definition of Level B Harassment for those species managed by NMFS. Level A takes based on current NMFS Technical Acoustic Guidance[1] would not be anticipated and therefore were not requested or issued by NMFS. No long-term or significant effects

[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.

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 and other acoustic sources (e.g., multibeam echosounders, etc.). 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 surveys that may result in cumulative impacts to environmental resources." The potential cumulative effects of the Proposed Action were evaluated in Section 4.1.6 of the Final EA. Due to the location of the Proposed Action, human activities in the area around the survey vessel would be anticipated to include other research, vessel traffic, naval and fisheries activities. Fisheries activities within the region and potential impacts are described in further detail in the Final EA, Chapter IV. No fish kills or injuries were observed during any previous NSF-funded seismic survey activities. 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 and heat probe. Any potential conflicts with ocean users would be avoided through Notice to Mariners and direct radio communications during the surveys. Considering the limited time that the planned seismic surveys would take place close to shore, and brief period of operations, and temporary nature of potential environmental impacts, the proposed project is not expected to have any significant impacts on human activities in the area.

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 information about thermal and structural features of the subducting plate that would be taken into account when developing models to evaluate geohazards related to the Cascadia Subduction Zone. 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, future 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.

Coordination with Other Agencies and Processes

NSF coordinated with NMFS to complete the Final EA prior to issuance of the IHA and BiOp/ITS in order for the NSF Final EA to be included in their Administrative Record. Based on discussions with NMFS during MMPA and ESA processes, minor refinements to the information provided in the Draft EA were made. The new information, which was included in the Final EA, however, did not alter the overall conclusions of the Draft EA and remained consistent with the PEIS.

Compliance with other federal statutes and regulatory processes are summarized below and in further detail in the Final EA, Section 4.1.8.

(a) Endangered Species Act (ESA)

On 14 December 2021, NSF submitted a formal ESA Section 7 consultation request, including the Draft EA, to NMFS for the proposed activity. On 1 August 2022, NMFS issued a BiOp and ITS (Attachment 2).

(b) Marine Mammal Protection Act (MMPA)
On 14 December 2021, an IHA application was submitted to NMFS by LDEO on behalf of itself, NSF, and the researchers pursuant to the U.S. MMPA for "taking by harassment" (disturbance) of small numbers of marine mammals during the proposed seismic surveys. On 23 June 2022, NMFS issued in the Federal Register a notice of intent to issue an IHA for the surveys and a 30-day public comment period. NMFS issued an IHA for the proposed activity on 1 August 2022 (Attachment 3).

(c) Essential Fish Habitat (EFH) (Magunson-Stevens Act)
NSF submitted an EFH consultation request on 1 March 2022 to NMFS. The EFH consultation and conclusions were incorporated into the ESA consultation.

(d) Coastal Zone Management Act (CZMA)
NSF submitted Negative Determinations to the states of Washington and Oregon on 11 February 2022. NSF received concurrences on the Negative Determinations from Washington on 31 March 2021 and Oregon on 16 February 2022.

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 ESA, MMPA, EFH, and CZMA is completed.

In sum, NSF concludes that implementation of the Proposed Action will not result in significant impacts after full consideration of the Final EA; the PEIS; the IHA and BiOp/ITS issued by NMFS; and the entire environmental compliance record. Accordingly, on behalf of NSF, I authorize the issuance of a Finding of No Significant Impact for the Proposed Action, the marine seismic surveys and heat probe activities proposed to be conducted on board Research Vessel *Marcus G. Langseth* in the Northeast Pacific Ocean, during the effective time period of the IHA, and hereby approve the Proposed Action to commence.

Bauke Houtman 2 August 2022

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

Attachment 1: *Final Environmental Assessment of Marine Geophysical Surveys by R/V Marcus G. Langseth of the Cascadia Subduction Zone in the Northeast Pacific Ocean, 2022*
Attachment 2: NMFS Biological Opinion/Incidental Take Statement
Attachment 3: NMFS Incidental Harassment Authorization