

3. Description of Proposed Activities and Potential Impacts on SARA listed species:

A Objective/Purpose of Research

L-DEO plans to conduct a seismic survey in the Endeavour MPA. The survey will obtain information on the sub-seafloor structure of volcanic and hydrothermal features that form as a result of movements of the Earth's plates. More specifically, the survey will obtain information on the 3-D seismic structure of the crust and top-most mantle along an 80-km-long section of the Endeavour segment of the Juan de Fuca Ridge. This information will define the distribution of magma beneath active volcanoes and the nature of the reaction zone that connects magmatic and hydrothermal systems. Such data will help us to better understand the transfer of energy and mass between the solid earth and the oceans. Past studies using manned submersibles and remotely piloted vehicles have mapped the locations and characteristics of vent fields along this ridge segment. The proposed study will extend that mapping beneath the seafloor and allow us to understand the dynamics of these systems. This study will provide basic subsurface constraints on the magmatic and hydrothermal processes that lead to the hydrothermal vents of the Endeavour MPA.

B Briefly explain field collections/study techniques

The procedures to be used for the survey will use conventional seismic methodology. The survey will involve one source vessel, the R/V *Marcus G. Langseth*, which will deploy an array of 36 airguns (total discharge volume of 6600 in³) as an energy source. The receiving system for the returning acoustic signals will consist of 64 Ocean Bottom Seismometers which the *Langseth* will also deploy and retrieve. As the airgun array is towed along the survey lines, the OBSs will receive the returning acoustic signals and transfer the data to the on-board processing system. The proposed seismic survey will consist of ~1800 km of survey lines. All survey effort will take place in water >1000 m deep. In addition to the airgun array, a multibeam echosounder (and perhaps a sub-bottom profiler) will be used at times during the survey.

C Describe anticipated or potential disturbances to each of the SARA-listed species in **2E**, include impacts on habitat(s) used by the species: List the species, the nature of harm, and the likelihood of harm or encounters (High, Medium, Low)

The main impact issue associated with the proposed seismic survey will be temporarily elevated noise levels in the marine environment. The effects of airgun sounds might include one or more of the following: masking of natural sounds, behavioural disturbance, and at least in theory, temporary or permanent hearing impairment, or non-auditory physical or physiological effects. However, it is unlikely that the project would result in any cases of temporary or especially permanent hearing impairment, or any significant non-auditory physical or physiological effects, especially given the proposed monitoring and mitigation measures. Some behavioural disturbance is expected, but this would be localized and short-term. The proposed project will not result in any permanent impact on habitats used by marine mammals or to the food sources they use. For all SARA-listed species for which this application is being submitted, the likelihood of harm or encounters in the proposed study area is low. The proposed activities will not jeopardize the survival or recovery of SARA-listed species.

Please refer to the accompanying Environmental Assessment for details.

NOTE: Please attach the project workplan/proposal to this application

4. Following from the criteria in Section 73 of SARA ; if impacts on a listed species are likely, the proponent should specify:

A	What alternatives to the proposed method of conducting the activity have you considered? How is the chosen method the best solution to reduce impact to the species?
	The seismic survey was planned with the smallest possible source practical that would meet the science objectives, thereby limiting sound levels emitted into the environment. Also, the fact that this survey is proposed for a deep, offshore area, minimizes encounters with marine mammals during the proposed activities. In addition, monitoring and mitigation procedures will be implemented as described below.
B	What mitigation measures have been included, and how do they minimize the potential impacts on listed species and/or habitats? What mitigation measures have been considered and not included, and for what reasons were they rejected?
	<p>Because the <i>Langseth</i> will be operating in the Endeavour Marine Protected Area and L-DEO has adopted requirements made by the Canadian DFO, the following mitigation measures will be implemented for the ETOMO Toomey experiment and are in excess of the conservative measures normally adhered to in accordance with US NMFS.</p> <ol style="list-style-type: none"> 1. Marine Mammal Observers: Three trained, DFO- approved marine mammal observers (one being Canadian, and DFO appointed) dedicated to maintaining constant observations for marine mammals during daytime operations in the ship's vicinity prior to and during seismic operations. Two will be conducting visual observations while the third is engaged with passive acoustic monitoring for vocalizing marine mammals. 5 approved MMO's will be onboard to allow breaks for visual observers who will be relieved after 4hr shifts. 2. Exclusion Zone: A marine mammal exclusion zone based on the estimated 160dB re 1 μPa(rms) isopleth around the airgun array, shall be used when conducting seismic acquisition. For example the exclusion zone radius will be 7690m when the full source (6600in³) is towed at 15m depth. A 500m exclusion zone will be used when operating the single mitigation gun (40in³). 3. Pre-Operations Monitoring: The exclusion zone shall be monitored for a minimum of 60minutes prior to initial ramp-up of the airgun array or resumption of operations following a shut-down due to a marine mammal sighting within the exclusion zone. 4. Power-down and Shut-down Triggers: Ramp ups of the full airgun array will begin with a single airgun and will be gradually increased over ~35 minute period. A complete shut-down of the array, including the single 40in³ airgun, will take place should a marine mammal be observed within or about to enter the 160dB exclusion zone for the respective source. Unless the marine mammal is within 500m of the source the array will be powered-down to a single mitigation airgun of 500m until ramp-up of the full array takes place. 5. Start-up Procedures following Shut-downs and Power-downs: Airguns will not be ramped-up following a shutdown unless the 160dB exclusion zone is visible and monitored by MMO's for at least 60 minutes. Should a complete shutdown occur for more than 9 minutes when the exclusion zone is not visible (e.g. thick fog, night) array ramp-up will not be initiated until the entire zone is visible. If for any reason the MMO cannot see the entire radius for the entire 60 minutes (i.e., rough seas, fog, darkness), or if marine mammals are near, approaching, or in the safety radius, L-DEO will not start up the airguns. If one airgun is already running, L-DEO may start the second gun without observing the entire safety radius for 60 minutes prior, provided that no marine mammals are known to be near the safety radius. 6. If a marine mammal is observed in the 160dB exclusion zone and the array is powered down and the animal is observed to leave the 160dB exclusion zone the array will be powered-up upon confirmation the animal is outside the exclusion zone. 7. Passive Acoustic Monitoring: (PAM) L-DEO will utilize the passive acoustic monitoring (PAM)

	<p>system, to the maximum extent practicable, to detect and allow some localization of marine mammals around the <i>Langseth</i> during all airgun operations and during most periods when airguns are not operating. One MMO will monitor the PAM at all times in shifts of 1-6 hr. A bioacoustician shall design and set up the PAM system and be present to operate or oversee PAM, and available when technical issues occur during the survey.</p> <p>8. If the North Pacific right whale is visually sighted, the airgun array will be shut-down regardless of the distance of the animal(s) to the sound source.</p>
<p>C</p>	<p>Will the sampling program jeopardize survival or recovery of the species, in light of responses to 4A and 4B above? If not, why not?</p>
	<p>This program will not jeopardize the survival or recovery of SARA-listed species. At most, some behavioural disturbance is expected, but this would be localized and short-term. In addition, few SARA-listed species are expected to be encountered during the proposed activities.</p>

Please send your completed application to the relevant DFO Regional office:

<p>Pacific Region (British Columbia, Yukon Territory inland waters):</p> <p>Courtney Druce 200-401 Burrard Street Vancouver, BC V6C 3S4 Bus: (604) 666-2792 F: (604) 666-3341 E-mail: sara@pac.dfo-mpo.gc.ca</p>	<p>Central & Arctic Region (Northwest Territories, Nunavut, Alberta, Saskatchewan, Manitoba, Ontario):</p> <p>Ray Ratynski Freshwater Institute 501 University Cr Winnipeg, MB R3T 2N6 Bus: (204) 983-4438 E-mail: RatynskiR@dfo-mpo.gc.ca</p>
<p>Quebec Region (Quebec, St. Lawrence River, Northern Gulf of St. Lawrence):</p> <p>Anne Lagacé Institut Maurice Lamontagne 850 Route de la Mer C.P. 1000 Mont-Joli, Québec G5H 3Z4 Bus: (418) 775-0585 E-mail: lagaceA@dfo-mpo.gc.ca</p>	<p>Gulf Region (southern Gulf of St. Lawrence):</p> <p>Marc Lanteigne 343 Université Ave Moncton, NB E1C 9B6 Bus: (506) 851-6212 E-mail: LanteigneM@dfo-mpo.gc.ca</p>
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