

Seitel Canada Ltd. East Coast Offshore Seismic Program, 2016 to 2025 (LGL February 2016)

GENERAL COMMENTS

Fish, Food and Allied Workers (FFAW-Unifor)

The timing of the activity coincides with the highest harvesting activity of our Membership.

The correct convention for the areas would be NAFO Divisions 3KLMNOPs and 4Vs, not 3K, 3L, 3M, 3N, 3O, 3Ps and 4Vs. There are multiple cases of this error in Section 4.3 Fisheries.

Nunatsiavut Government (NG)

The Nunatsiavut Government fundamentally disagrees with the length of the environmental assessment. The 10 year EA presents many problems which require clarification from the proponent:

- Within the 10-year authorization what are the opportunities for adaptive mitigation based on new information and technology? What reporting requirements exist in order to ensure adaptive and effective mitigation over the 10-year time period with regards to fisheries impacts, marine mammal impacts, and impacts to Inuit subsistence activities? What power does the C-NLOPB or its stakeholders have to encourage the use of new techniques that are developed during the length of the program? For example, the Pacific and Western Arctic jurisdictions of Canada have used Section 13 of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (Statement of Practice) to establish mitigations based on received levels of sound within the marine environment. This action was instituted because the minimum 500m was modelled and found to be insufficient to prevent harm to marine mammals in certain project areas.
- The cumulative effects impact assessment does not incorporate climate change and the subsequent impacts to the marine environment and associated VECs. As this is a 10-year environmental assessment, the impacts of climate change should be included in the assessment. In 2010, the Canadian Environmental Assessment Agency published a guidance document called Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners (<https://www.ceaa-acee.gc.ca/default.asp?lang=En&n=A41F45C5-1&offset=1&toc=show>). This guidance document clearly outlines the importance of incorporating possible climate change impacts into the cumulative effects assessment. As a designated responsible authority under the Canada Environmental Assessment Act, the C-NLOPB is responsible to ensure proponents are following best practices not only in their operations but also in their environmental assessment practices.

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- Paragraph 19(1)(a) of CEAA 2012 specifies that a project EA must take into account environmental effects, including cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out. This environmental assessment does not clearly state the proponent's scenario with which they are assessing their own cumulative effects of a 10-year program. The proponent states that the maximum possible combinations within each year are 2D and 2D or 2D and 3D; therefore section 5.8 should detail a scenario that includes one of these combinations each year for 10 years to assess cumulative effects.
- The maintenance of adequate separation of seismic projects is insufficient to reach a conclusion of "not significant" impacts to VECs. The concept of avoiding overlapping sound does not assess the impacts of diverted migration patterns or movements from multiple seismic projects, nor does it assess the impacts of multiple exposure events to VECs. Section 5.8.3 should detail the references and studies used to conclude that "any cumulative effects... will be additive (not multiplicative or synergistic) and predicted to be not significant."
- In addition, a 10-year environmental assessment should assess the impacts to the marine environment over 10 years. Section 5.8.3 of the environmental assessment has only assessed the potential for "cumulative effects with other seismic programs proposed for 2016 (e.g., WesternGeco, MKI, Statoil, GXT). If the proponent is applying for a 10-year project, the environmental assessment should be able to properly assess cumulative effects over that time span by assessing the certain and probable projects over that time period – otherwise each project should reduce the scope to an assessable timeframe; likely resulting in each seismic project being treated as an annual or bi-annual project with separate environmental assessments.
- The Nunatsiavut Government also takes issue with the referencing of previous EA studies to validate or defend a position. Rather than providing evidence to support conclusions, the proponent has instead asked the reviewer to refer to past EAs that are not included in the document. This practice is done throughout the document (ex. 4.5.11, 5.5, 5.7.4.1, 5.7 etc). This is poor EA practice and should be discouraged by the regulator.
- A major gap within the EA is the absence of a defined monitoring plan. A monitoring plan needs to be in place if they wish to provide new plans for each year. Clarification and details on the plan is requested from the proponent.

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- The Nunatsiavut Government recommends that sound source verification be conducted in advance of project commencement (within a week prior to project start date), as is common practice in other Canadian jurisdiction. Verified sound propagation and modeling would ensure that seismic sound stays contained within the project area, including outside of the 'the Zone', and ensures that it does not exceed disturbance levels. Results of verification should be sent to regulators and relevant stakeholders immediately.
- The EA states that DFO has not adopted any noise exposure criteria. With regards to the issue of preventing temporary threshold shift (TTS) and behavioral disturbance, the Western Arctic and Pacific Regions of DFO Canada have recommended precautionary noise exposure criteria within their advice provided to the National Energy Board. In the Western Arctic, criteria are based on 180 dB to avoid temporary threshold shift. It should be noted that seismic operations were successful in gaining their data when applying the mitigation recommended by DFO Western Arctic. In the Pacific Region, a safety zone is required to be modelled to correspond to 160 decibels is established to avoid behavioural disturbance (CSAS, 2014). This approach is based on Section 13 of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment that allows for incorporation of new mitigation measures based on sound variation in the environment as well as cumulative effects.
- Considering the high number of potential projects in the area over the 10-year span of this EA, a precautionary approach to seismic mitigation for cetaceans and sea turtles is recommended. 500m is stated as a minimum in Section 2.2 of this environmental assessment. It is recommended that sound propagation modelling should be done to assess the potential impacts to marine life throughout the project area. It should be noted that the Statement of Practice is based on a 2004 CSAS document that outlines the large data gaps and potential consequences in seismic mitigation. It states that "risks of these consequences are poorly quantified, often unknown, and likely to be variable with both conditions of the environment and of the organisms exposed to the sounds."
- With regards to the consultations in the appendices, please explain why specific recommendations regarding scallops and bivalves were not specifically included in mitigation and monitoring measures as encouraged by Ocean Choice International.

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SPECIFIC COMMENTS

Canada – Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB)

§ 1.0 Introduction, page 1 – the *Canada-Newfoundland Atlantic Accord Implementation Act* is incorrectly reference. It should be *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act*. Please correct accordingly.

§ 1.1 Relevant Legislation and Regulatory Approvals, page 1, first bullet – the *Canada-Newfoundland Atlantic Accord Implementation Act* is incorrectly reference. It should be *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act*. Please correct accordingly.

§ 2.2 Project Overview, page 6 –The maximum amount of 2D, 3D and/or 4D to be collected annually between 2017 and 2024 should be identified and included in the effects assessment.

§ 2.2.6 Seismic Energy Source Parameters, page 7 – The project description indicated a total volume of an airgun array ranging from 3,000-6,000 in³ and the project was scoped as this range, but the EA Report has the upper limit as 8,000 in³. Please clarify.

§ 2.2.7 Seismic Streamers, page 7 – Please identify the maximum streamer length and depth range in 2017-2025 for all proposed programs.

§ 2.2.8 Ocean Bottom Nodes, page 8 – More information is required on the use of Ocean Bottom Nodes (PBNs) (e.g. maximum length of time on sea bottom), including effects assessment of this activity.

§ 2.2.9 Gravity and Magnetic Surveys, page 8 – Although the potential to conduct gravity and magnetic surveys is identified here, they do not appear to have been included in the effects assessment.

§ 2.2.11 Waste Management, page 9 – Although it is stated that Seitel will follow MARPOL 73/78 Annex IV and Annex V for waste management, the effects assessment of this activity states that “.....garbage will be brought ashore”. Please confirm the proposed approach to waste management.

§ 2.3 Mitigation and Monitoring, page 10 – Will the fisheries compensation program be submitted with the application to conduct a geophysical program? Is there a fisheries compensation program already developed?

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§ 2.4.1 Environmental Features, Figure 2.2, page 11 – The figure does not show Seitel’s Project Area.

§ 2.5 Consultations, page 13, first two bullets – The results of consultation sessions with Labrador stakeholders should be provided.

§ 2.7 Environmental Monitoring, page 14 – there seems to be a lot of description for the MMOs, see comment above with respect to § 2.2 Project Overview, and very little with respect to seabird observations. Both MMOs and SBOs are required and to add additional responsibilities to MMOs, dealing with seabird observations and stranded bird handling, may appear to be diminishing the importance of both observation programs. The C-NLOPB recommends there be a dedicated MMO and a dedicated Seabird Observer (SBO).

§ 5.9 Mitigation Measures and Follow-up, 2nd para, line 4, page 195 – Please see Section II of the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2012). It does not state that only “contacts with fishing gear with any identifiable markings” will be reported to the C-NLOPB. It states that “any incidents of contact with fishing gear” will be reported to the C-NLOPB.

§ 5.9 Mitigation Measures and Follow-up, Table 5.19, page 196 – Please identify the proposed mitigation measure for the use of ocean bottom nodes in sensitive areas.

Fisheries and Oceans Canada (DFO)

§ 2.2.8 Ocean Bottom Nodes, page 8 – This section notes that the proponent plans to use cable less Ocean Bottom Nodes (OBNs) in conjunction with towed streamers during surveys planned for 2017 – 2025. From that description it is assumed that OBNs will not be deployed during surveys planned for 2016, this should be confirmed. It should also be noted that details relative to the OBNs sites (e.g. coordinates, benthic habitat substrates, water depth, presence of important benthic habitat features (e.g. sponge/corals, invertebrates species)) and description of potential impacts and mitigations of potential impacts of OBN deployment on benthic habitat will be provided in annual project EA Updates.

§ 4.2 Fish and Fish Habitat VEC, page 42 - regarding the last sentence in this section “...data gaps identified in the two SEAs are also discussed...” the two SEAs should be identified as there are three SEAs referenced in this section.

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§ 4.2.2 Fish – Northern Shrimp 2nd sentence 1st paragraph, page 55 - the reference to “.....*snow crab*.....” in this sentence should be removed and replaced with “...northern shrimp...”

§Section 4.2.3 Fish and Fish Habitat Data Gaps Identified in Relevant SEAs, page 61 - regarding the last sentence in this section “*Any new information that has been made available since the two SEAs were completed...*” there are three SEAs referenced in this section, as such the last sentence be amended to make reference to “...*three SEAs*...”. Based on Section 5.2.2 of the Project EA Scoping Document it is not clear if (or how) the project EA has “...*described the relevance of such data gaps in the conduct of the EA*” this should be clarified.

§ 4.3.4 Traditional and Aboriginal Fisheries, page 61 – there are a number of sentences (e.g. 3rd sentence 1st paragraph, 1st sentence 2nd paragraph and 3rd sentence 4th paragraph) that incorrectly reference “...*DFO, Resource Management and Aboriginal Affairs*.....” These sentences should be amended to refer to “...*DFO, Resource Management and Aboriginal Fisheries*.....”

§Section 4.5.1 Marine Mammals, page 123 - Regarding Table 4.17, appropriate population names should be included for those species noted as being listed under SARA or by COSEWIC.

§ 4.6 Species at Risk, page 135 - regarding the last sentence in this section “*Relevant data gaps identified in the two SEAs are also discussed...*” there are three SEAs referenced in this section, as such the last sentence should be amended to make reference to “...*three SEAs*...”. or the two referenced SEAs should be identified in the sentence accordingly..

§ 4.7 Sensitive Areas, page 142 – This section should be amended to include reference to the approximately 60 km² Gilbert Bay Marine Protected Area (MPA) located on the southeast coast of Labrador in NAFO Subdivision 2J which was formally designated in 2005 to conserve and protect Gilbert Bay cod and its habitat.

§ 5.5 Mitigation Measures, page 149 – the 4th bullet should also include reference to the *Species at Risk Act*. This section should also note that the *Marine Mammal Regulations (MMR)* under the *Fisheries Act* is currently undergoing amendment. While public consultation on proposed amendments have only just recently ended it should be noted that Schedule 11 of the proposed amended *MMR* provide approach distances for marine mammals based on species, vehicle (vessel, aircraft, etc), area and timing. Given that the proposed seismic survey(s) are scheduled to run from 2016 to 2025 it is recommended that the proponent be aware of any potential implications that may arise

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if any proposed amendments to *MMR* are accepted during the timeframe covered by the proposed survey program.

§ 5.7.4 Fish and Fish Habitat VEC, page 154 – as described in Section 2.2.8 the proponent has noted plans to deploy up to 10,000 OBNs within survey areas in conjunction with the deployment of hydrophone streamers. The OBNs will be placed on the sea floor in as yet unknown or unspecified locations. To indicate in the 2nd sentence of this section that *“The seismic program will not result in any direct physical disturbance of the bottom substrate”* is not entirely accurate and not in keeping with information presented in Table 5.2 and Vessel/Equipment Presence (page 159). This sentence should be amended accordingly.

§ 5.7.4.1 Sound, pages 156-157 – The 2nd sentence 5th paragraph (page 156) which notes that *“Available experimental data suggest that there may be physical impacts on the fertilized eggs of snow crab and on the egg, larval, juvenile and adult stages of cod at very close range”* requires an appropriate reference. The 1st sentence 2nd paragraph (page 157) which notes that *“Snow crab, thought to be sensitive to the particle motion component of sound only..”* requires an appropriate reference and since this is the first mention of particle motion a definition / description should be provided. The 1st sentence 4th paragraph (page 157) which notes that *“The physical effects of exposure to sound with frequencies >500 HZ are negligible, based on the available information from the scientific literature.”* requires an appropriate reference.

§ 5.7.4.1 Sound (Fish and Fish Habitat VEC) (page 154-157) – this section should include a short summary discussion (similar in detail to that provided for physical effects) of the potential behavioural effects in fish in relation to seismic sound (e.g. startle response; change in swim speed, depth and direction; schooling; reproduction; recruitment; feeding) that are reported in literature including among others - Popper and Hawkins 2012 *Advances in Experimental Medicine and Biology* Vol 730 - and other project EAs and applicable SEAs. This will also provide support to the linkage to the discussion on effects of seismic sound on Fisheries VEC presented in Section 5.7.5.1 of the EA Report.

§ 5.7.4.2 Vessel/Equipment Presence, page 159 – Although OBN use is predicted to have negligible / non-significant impacts on fish and fish habitat VECs it is felt (see above comment on Section 2.2.8) that subsequent annual project EA Updates should provide details relative to OBNs deployment (e.g. site coordinates, benthic habitat / substrate, water depth, presence of important benthic habitat features (e.g. sponge/corals, invertebrates species)) and any associated updated description of potential impacts and mitigations of potential impacts of OBN deployment on fish, fish habitat and sensitive areas. It should be clarified (either here or later in Section 5.7.9 Sensitive Areas VEC page 192) whether OBNs will be placed in sensitive marine areas and to what extent

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such placement is in keeping with regulations, accepted practices, restrictions and/or guidelines which may be in place governing activity within NAFO coral closure areas and/or other marine sensitive areas.

§ 5.7.7.1 Sound, Marine Mammals and Sea Turtle VEC, pages 174 and 175 – with respect to the discussion of Masking while it is safe to say (see 2nd sentence on page 175) that *“Based on past and current reviewed research, the potential for masking of marine mammal calls and/or important environmental cues is considered low...”* It is felt that this section should provide a short summary (similar to that provided on pages 175 and 176 for Disturbance, Hearing Impairment and Non Auditory Physical Effects) of some of the potential effects on masking that are provided within among others Erbe *et al* 2015 and Guan *et al* 2015.

§ 5.7.7.1 Sound (Marine Mammals and Sea Turtle VEC) Hearing Impairment, page 176 – Regarding the 2nd sentence of the 4th paragraph examples of the *“Several aspects of the planned monitoring and mitigation measures for this project are designed to detect marine mammals and sea turtles occurring near the airgun array”* should be provided either here or more likely in the discussion of project mitigations and monitoring (Sections 5.5 and 5.9). If monitoring other than visual monitoring of the 500 m safety zone is planned then the EA Report (e.g. Sections 5.5 and/or 5.9) should specify same and a linkage provided in the above noted 4th paragraph.

§ 5.9 Mitigation Measures and Follow up, pages 195-197 – the 3rd and 4th sentences of the 1st paragraph on page 197 note that *“...observers will watch for marine mammals and sea turtles when the air gun array is active ..”* and that *“...the array will be shut down whenever endangered and/or threatened marine mammals or sea turtles are sighted within the safety zone”*. That being said it is not clear what measures will be employed to monitor for SARA listed endangered and/or threatened mammals and sea turtles during periods of darkness and/or low visibility. This should be clarified accordingly.

Nunatsiavut Government (NG)

§ 5.1.1.1 Seitel’s Consultation Approach, page 144 - The language regarding consultation in this section is unclear. The section states that Seitel will consult with stakeholders after the survey is permitted, but also states that before permitting that there will be discussions regarding issues and concerns, communications, and mitigations. Please clarify the difference between the ‘consultation meetings’ and the meetings prior to the permitting process. In addition, please clarify what will be reported to the stakeholders within the follow-up communications after each project is

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completed. Please clarify how a monitoring plan will be developed and incorporated into this reporting prior to the approval of the environmental assessment.

§ 5.5 Mitigation Measures, pages 149 and 150 - this section states that the mitigation measures will “be adhered to during each survey year, with necessary adjustments based on monitoring and follow-up.” It is common practice to provide the environmental and mitigation monitoring plan within the environmental assessment. This is not included. Please clarify the type of monitoring plans that will be included prior to the approval of the environmental assessment and the consultation that will occur prior to the completion of the monitoring plans.

§ 5.7.7.1 Sound, pages 173 to 184 - this section should distinguish between difference classes within species (e.g. cow calf pairs) as well as providing references with regards to the conclusions of only localized and short-term effects for cetaceans and marine turtles. The Strategic Environmental Assessment for the Labrador Shelf Offshore Area states that there is limited information regarding cetaceans and marine turtles in the assessment area, leading to data constraints and uncertainty of impacts.

§ 5.7.8 Species at Risk VEC, pages 187 to 192 - An environmental assessment is meant to show the assessor the specifics behind conclusions of significant impacts. This section should clarify the ways that the “potential effects of activities associated with Seitel’s proposed seismic program are not expected to contravene the prohibitions of SARA (§ 32(1), 33, 58(1)).” There is no description of the prohibitions within SARA and how each will not be contravened.

§ 5.9 Mitigation Measures and Follow-up, pages 195 to 197 – this section outlines the mitigation measures in regards to a marine mammal or sea turtle occurrences within 500m of the array. Please clarify if 500m will be used as a minimum standard as recommended by the Statement of Practice and cited in Section 2.2. Please also further define scenarios within marine mammal mitigation with regards to what happens in low visibility and outline the discretion that MMOs have within the shutdown process.

§ 5.9 Mitigation Measures and Follow-up, page 195 - “commits to ongoing communications with other operators with active seismic programs within the general vicinity of its seismic program to minimize the potential for cumulative effects on VECs.” Please clarify how these reports will be incorporated into the monitoring program and reported within the post-season follow-up.

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§ 5.1.1.2 Program Consultations, page 146 - FFAW/Unifor should be used consistently.

§ 5.7.4.1 Sound, pages 156-157 - ““In the case of eggs and larvae, it is likely that the numbers negatively affected by exposure to seismic sound would be negligible when compared to those succumbing to natural mortality,” is a very strong statement to make. It is noted that LGL identifies and acknowledges the data gaps existent in this base of knowledge and that “available experimental data suggest that there may be physical impacts on the fertilized eggs of snow crab and on the egg, larval, juvenile and adult stages of cod at very close range.” Therefore, the former statement is problematic as a sound knowledge set to back the statement up is lacking. Likewise, stating that spatial and temporal avoidance of key life stages, as well as ramp-up procedures, should mitigate these effects is unsatisfactory when we do not know the effects of seismic activity on these species.

Similarly, the sentence that, “Limited data regarding physiological impacts on fish and invertebrates indicate that these impacts are both short-term and most obvious after exposure at close range,” states the key issue – “limited data.” Until a more thorough examination has been made and conclusions have been agreed upon we cannot be sure that effects are indeed short-term.

§ 5.7.5.1 Sound, page 163 - “While some of the behavioural effects studies report decreases in catch rates near seismic survey areas, there is some disagreement on the duration and geographical extent of the effect,” highlights one of our key concerns with seismic activity in commercial fish harvesting areas. As there has not yet been agreement on the effects of seismic on catch rates we reiterate that activity should not occur when harvesting is taking place, nor during key research times.

Appendix A, page A-2/A-3 - We would like to once again stand by our Membership in that the southernmost potential area for survey, including the Carson Canyon, are to be avoided by seismic activity as these are very important snow crab harvesting grounds. Members in attendance at consultation stressed that they will not allow seismic activity in these areas and we are supportive of this stance

Appendix A, page A-7 - Johan Joensen is incorrectly identified as Petroleum Industry Liaison. Robyn Lee was the Petroleum Industry Liaison at time of consultation, not Johan Joensen as identified.