Preamble

This document serves as MKI's response to comments on its recent (June 2017; LGL 2017a) Amendment of the Environmental Assessment (EA) of the Northeast Newfoundland Slope 2-D Seismic Survey Programme 2012–2017 (the Project) (YOLO/RPS 2012) and the Project's previous EA Amendments (Keel/RPS 2015a,b; PGS 2015, 2016; LGL 2016). The review comments on the Amendment were recently provided to MKI (on 10 July 2017) by the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB).

MKI's responses (in blue, italic font) are typically provided at the end of each comment. However, for two comments (GEAC/CAPP, FFAW/Unifor) the responses are interspersed throughout the comment so that particular aspects of the comment can be addressed clearly.

GENERAL COMMENTS

Canada-Newfoundland and Labrador Offshore Petroleum Board

In light of the recently released publication, *Widely Used Marine Seismic Survey Air Gun Operations Negatively Impact Zooplankton* (McCauley, R. et al. Nature Ecol. Evol. 1, 0195 (2017)), please report on the implications of the study results for the conclusions of the environmental assessment and the mitigation measures that are described therein.

MKI Response: *The reported results in McCauley et al. (2017) do not change either the conclusions of the EA (YOLO/RPS 2012), its associated amendment documents (Keel/RPS 2015a,b; PGS 2015, 2016; LGL 2016) and the current Amendment (LGL 2017a), or the mitigation measures described therein. While the study suggests that there could be an effect of exposure to airgun sound on zooplankton, including mortality, there is need for experimental replication and study design revision before anything conclusive can be stated regarding the effects of airgun sound on zooplankton. The study was conducted over two days only so any follow-up study should have a longer duration to account for natural variability in behaviour and generate more data. Another aspect of the study that causes more uncertainty is the attempt to account for water body movement due to surface currents with respect to sampling the zooplankton to determine mortality rate and makeup of the zooplankton community. It is important to continue the study of the potential effects of exposure to airgun sound on marine biota, in this case zooplankton.*

Environment and Climate Change Canada (ECCC)

The Canadian Wildlife Service of Environment and Climate Change Canada (ECCC-CWS) notes that mitigations regarding migratory birds as outlined in the EA are to be used on all three 3D seismic survey ships.

MKI Response: *MKI confirms that the mitigation measures outlined in the EA Amendment will be implemented on all three 3D seismic survey ships (as well as the MKI 2D seismic survey ship).*

Groundfish Enterprise Allocation Council (GEAC)/Canadian Association of Prawn Producers (CAPP)

We understand that this amendment was put forward to validate that the conclusions of the original assessment remain supported in light of increased, simultaneous effort planned for the 2017 season. Furthermore, we accept that having multiple simultaneous surveys is not new in NL waters; however we cannot conclude that because the surveys were conducted, no impact was experienced to fish, fish habitat or the fishery. This is especially important because such a rationale would not be sufficient in a decision-making context of fisheries management and this discrepancy is troublesome.

With respect to the assessment of effects, we must question some key components of the amendment proposal.

The impact to fish and fish habitat is clearly lacking in substance. Although the level of effect is expected to be 'non-significant', the confidence in the assessment is described as 'low to medium'. In the text, the introduction of a 30 km spacing between airgun arrays should decrease the 'probability' of synergistic effects, without describing what those effects may be; what scalar movement is required to reduce the synergistic effects; and how the 30 km distance will achieve this outcome. We cannot agree with the assessment presented.

Based on the best available, albeit limited, scientific data and LGL's professional judgement, MKI still contends that the residual behavioural and physical effects of exposure to airgun sound from simultaneously conducted 3D seismic surveys on the Fish and Fish Habitat VEC will be not significant. The minimum separation distance between operating airgun arrays (i.e., 30 km) will certainly reduce the levels of sound being received by invertebrates and fishes at any particular location within the 'simultaneous 3D survey area'. Whilst the 30-km minimum separation distance between seismic surveys is somewhat arbitrary it is well accepted in the Gulf of Mexico by industry, U.S. regulators (National Marine Fisheries Service, Bureau of Ocean Energy Management) and environmental groups alike. MKI agrees that further study of the potential effects of exposure to airgun sound on marine invertebrates and fishes is necessary in order to strengthen levels of confidence associated with predicting the significance of residual effects.

Again, with reference to fisheries impacts, we find a similar absence of assessment. The gap in scientific knowledge leads to a low-confidence assessment of 'no impacts'. We feel that this conclusion is inconsistent with the precautionary approach to fisheries and habitat management that we are regulated under by the Department of Fisheries and Oceans, and such a lens should also be applied in this assessment. As in the past, we contend that the impacts are significant and experienced far afield from the source location and last for an extended period after the airgun array has been deployed. This requires further study on the part of the applicant, and should be undertaken prior to exploration activity being further intensified (as is requested by this amendment).

As stated above in relation to the comment on the Fish and Fish Habitat VEC, the prediction that the residual behavioural and physical effects of exposure to airgun sound from simultaneously conducted 3D

seismic surveys on the Fisheries VEC will be not significant is based on the best available, albeit limited, scientific data and LGL's professional judgement. MKI would be interested in seeing the evidence that makes GEAC/CAPP contend that 'the impacts are significant and experienced far afield from the source location and last for an extended period after the airgun array has been deployed'. That being said, MKI agrees that further study of the potential effects of exposure to airgun sound on fisheries is necessary in order to strengthen levels of confidence associated with predicting the significance of residual effects.

We have historically attempted to address our concerns regarding the direct impacts of seismic activity on fishery activities on a case by case basis directly with the operator. This has been effective, save for some recent instances where planned activity has been re-allocated due to conflict with other sectors, leading to a direct impact on operations.

Being forced to accept impacts to our activities because of a resistance of other sectors to accommodate seismic activities is unacceptable.

MKI will work with all stakeholders and take individual requirements into consideration when planning our season. It is imperative that there is a two way flow of information between all parties involved. MKI continues to provide open lines of communication through the weekly meetings with fisheries groups and to provide look ahead maps for the coming week's seismic acquisition.

We cannot agree with the cumulative effects assessment as presented. The assessment is again challenged by a lack of knowledge on the impact of multiple surveys on fish, fish habitat and fisheries.

Because of this lack of knowledge, a conclusion of 'no significant effect' is achieved, with a low to medium confidence in this decision. Again, we are forced to look at this in the context of fisheries and habitat management whereby an absence of information forces a precautionary approach to be applied. While we cannot make a decision on allowable stock removals or benthic impacts in face of poor information, why would we allow such activity in the context of seismic exploration?

Lastly, we note that the follow-up monitoring includes only sea turtles and mammals.

Without a detailed plan to address existing data gaps, we are forced to ask how our understanding of direct and/or cumulative impacts of exploration will be understood without any monitoring or attempt to assess if those effects exist and the magnitude of those effects?

Currently, the only indirect follow-up monitoring for the Fish and Fish Habitat VEC and the Fisheries VEC is through harvesting associated with both commercial and research fisheries. In each case, the focus of the activity is not to validate environmental assessment predictions. This idea of indirect monitoring is fraught with problems but at the moment is the only source of information on invertebrates and fishes over such a large geographic area. MKI agrees that further study of the potential cumulative effects of exposure to airgun sound and all other offshore activities, including commercial fishing, on marine invertebrates and fishes, and associated fisheries is necessary in order to strengthen levels of confidence associated with predictions of significance.

We are clearly concerned at this amendment and the apparent increase in seismic exploration activity in the Newfoundland and Labrador region. This is having real effects on our fishing activity and we suspect

it is having impacts on the ecosystem itself. A continued identification of a data gap is not sufficient to adequately address our concerns and this must be rectified prior to further activity being authorized.

We acknowledge the reviewers point. As a point of clarity, the level of seismic activity in 2017 is actually similar to the last few years (see the first paragraph on page 3 of the EA Amendment). The key difference is that this year all seismic surveying is being conducted by the same operator.

Fish, Food and Allied Workers (FFAW/Unifor)

Our concern is not with respect to the amendment's addition of a third 3D seismic vessel as the different areas designated for each seismic vessel in 2017 are distinct.

We do have grave concerns however regarding the timing of seismic data acquisition of two of the planned programs this year – Harbour Deep and Cape Broyle.

To begin, there will be active commercial snow crab fishing in NAFO Divisions 3L and 3N during the month of July, when the company plans to start seismic work in Harbour Deep and Cape Broyle. The commercial crab quota has not been caught to date in these areas and we anticipate fishing activity to remain active in these areas until the end of the month.

MKI aims to schedule its ongoing seismic surveys to have no impact on commercial fishing. It is imperative that there is a two way flow of information between all parties involved so that active fishing gear can be avoided. MKI continues to provide open lines of communication through the weekly meetings with fisheries groups and to provide look ahead maps for the coming week's seismic acquisition.

Additionally, the members of FFAW/Unifor have ongoing concerns with seismic activity being conducted in the vicinity of post-season crab survey stations prior to the stations being sampled for the year. The collaborative DFO-industry post season crab survey starts in September and continues until November. MKI's schedule of 3D seismic work in the Harbour Deep (mid-July to mid-October) and Cape Broyle (mid-July to end of August) prospects will not allow for the DFO-industry post-season crab survey to be executed without interference from seismic activity.

MKI will continue to observe both temporal and spatial buffers between areas of seismic surveying and post-season crab survey stations in line with all DFO scientific surveys. The pre-survey temporal and spatial buffers currently being applied to DFO RV surveys are seven days and 30 km, respectively.

This post-season crab survey is vital to the fishing industry as it informs decision making with regards to quotas for coming years. Our members rely on this survey to be completed each year, without interruption or potential effects from outside variables. To date this survey has occurred uninterrupted by seismic or other oil and gas activity, allowing confidence in the index and time series. The current proposed activity by MKI poses to throw an unknown into the data as we are currently unsure of the effect of seismic activity on snow crab catchability, behaviour and physiology. It also threatens the time series of what has been a longstanding collaborative index between fish harvesters and science. Any potential impact on the survey will have significant consequences for the crab fleets – be it either short or long term.

The collaborative DFO-industry post season crab survey is undergoing changes in terms of the location and number of survey stations. Changes have not been confirmed for 2017. While this is frustrating for planning all around it continues to be FFAW/Unifor's position that seismic work should NOT be conducted

in the vicinity of survey stations until they have been sampled for the year. We have been consistent in this position with all seismic activity and remain steadfast in our stance. This is an important time series.

In the past, we have worked cooperatively with MKI on this issue and anticipate the same level of understanding going forward. We must ensure our members' concerns are heard and addressed, and we must also ensure that the importance of both the fishery and the post season industry collaborative snow crab survey are recognized across each of our industries.

MKI will continue to observe both temporal and spatial buffers between areas of seismic surveying and post-season crab survey stations in line with the commitments detailed in our EA and conditions of the geophysical authorizations.

It should also be noted that FFAW/Unifor only became aware of the timing of the planned seismic programs for Harbour Deep and Cape Broyle within the past month. (The Harbour Deep prospect has also not been mentioned in previous EA updates for 2017). This is not an acceptable time frame as our initial awareness of these programs falls in the middle of what is the busiest fishing season, not allowing consultation with our membership nor a sufficient amount of time for our members concerns and viewpoints to be properly voiced.

MKI has always tried to provide information to stakeholders regarding survey details as early as possible to allow for sufficient season planning. Potential areas for 3D acquisition in 2017 were highlighted in a meeting held with FFAW/Unifor in January 2017 and the area of the Harbour Deep survey was included in the information presented at that time. Unfortunately, it was not until late May that MKI received commitments to acquire the survey in 2017. As a result only the Cape Broyle survey was included in the EA Update (LGL 2017b) that was circulated to stakeholders in April 2017.

Association of Seafood Producers (ASP)

The expanding nature of seismic and other operations in waters surrounding our coast is a growing concern for industry, including ASP members. In these times of apparent eco-system shift and change in species abundance (e.g. from apparent shellfish back to groundfish), questions are often raised about the impacts of seismic surveys, for example. Current studies underway - most particularly related to snow crab in 3L - are important in increasing our understanding of the potential negative impacts from such operations, and most specifically seismic, but they cannot always address the legitimate concerns of industry in a timely matter. Additional concerns related to specific program timing have been raised, for example, in correspondence of today's date submitted by the FFAW-Unifor in response to the MKI program.

One general concern is that the Statement of Canadian Code of Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment (DFO2007b) is now some 10 years old, and may necessitate some changes and updating in response to new science and expanding industry – both fisheries and oil and gas - understanding of the issues relating to seismic and other activities which have the potential to impact on fish and fish habitat.

MKI agrees that the Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment should probably undergo review and revision considering scientific research done since it was released about 10 years ago.

Additionally, referencing the Nexen Energy ULC-specific EA of June 2017, section 5.4.2 and most specifically Table 5.2 which summarizes existing knowledge of potential environmental impacts on marine

fish and fish habitat, we would propose that the existing knowledge be compiled and presented more comprehensively for the joint benefit of both industries, i.e. we are not proposing any required change to the Nexen EA, but rather that the appropriate agencies and/or organizations be tasked with a more detailed and comprehensive summary of existing knowledge in these matters. That could also be extended to a best practices review of codes of practice for the purposes of updating the Canadian code of practice with respect to mitigation.

In closing, we would echo concerns raised in recent correspondence from Groundfish Enterprise Allocation Council (GEAC), and in particular the gaps in scientific knowledge that lead to what may be considered premature conclusions of a low-confidence assessment of 'no impacts'. This would appear inconsistent with the Precautionary Approach (PA) to fisheries and habitat management that we are regulated under by Fisheries and Oceans Canada (DFO).

As indicated in the response to the GEAC/CAPP general comment on this Amendment, MKI recognizes the data gaps associated with this issue and agrees that substantial scientific work is needed in order to strengthen the levels of confidence associated with environmental assessment predictions.

DFO defines the Precautionary Approach as follows:

> In general, the precautionary approach in fisheries management is about being cautious when scientific knowledge is uncertain, and not using the absence of adequate scientific information as a reason to postpone action or failure to take action to avoid serious harm to fish stocks or their ecosystem. This approach is widely accepted as an essential part of sustainable fisheries management.

While a complete application of the PA to seismic impacts may be impractical, it is clear that additional work is required beyond representations such as Table 5.2 to ensure a fuller consideration of the potential impacts of seismic and related oil and gas industry activities to fish and fish habitats off our coast.

MKI agrees that further study of the potential effects of exposure to airgun sound on marine invertebrates and fishes, and associated fisheries, is necessary in order to strengthen levels of confidence associated with predictions of significance.

SPECIFIC COMMENTS

Canada-Newfoundland and Labrador Offshore Petroleum Board

Section 1.0 Introduction, pg 1 – The EA Amendment should provide an assessment of three 3-D vessels and one 2-D concurrent seismic vessels operating in the Project Area.

MKI Response: *An assessment of three 3-D vessels and one 2-D seismic vessel surveying concurrently within the Project Area was assessed in Section 3, Cumulative Effects, of the Amendment. However, we acknowledge the C-NLOPB's point that this operational scenario should have been assessed as "within Project" cumulative effects in Section 2 of the Amendment.*

The appropriate edits will be made to Section 1.0, Introduction*, and to* Section 2.0, Assessment of Simultaneous Seismic Surveys*, to reflect this.*

Section 2.0 Assessment of Simultaneous Seismic Surveys, pg 2 – *The effects of two concurrent 3-D seismic surveys and a 2-D survey were* ***assessed*** *in the 2017 EA Update.* The purpose of an EA Update is to outline the proposed activities, confirm that the proposed program activities fall within the scope of the previously assessed program, and indicate if, with this information, the EA predictions remain valid. In addition, information shall be provided regarding the adaptive management of requirements of the *SARA* into program activities (e.g., introduction of new species or critical habitat to Schedule 1; additional mitigations; implementation of recovery strategies and/or monitoring plans). If there are any changes in the scope or if new information becomes available that may alter the EA conclusions, then a revised EA will be required at the time of authorization application and/or renewal.

MKI Response: *Noted. We propose the following edits (see yellow highlight) to the paragraph in question:*

As indicated in the EA of MKI's Northeast Newfoundland Slope 2-D Seismic Survey Programme 2012–2017 (YOLO/RPS 2012) and subsequent Amendments of this EA (Keel/RPS 2015b,c), MKI may conduct 2-D and 3-D seismic surveying in its Project Area (Figure 2.1) between May 1 and November 30 until the end of 2017. Concurrent 2-D and 3-D seismic surveying has been assessed in a prior Amendment (Keel/RPS 2015c). An EA Update for 2017, which outlined proposed activities known at the time (i.e., two concurrent 3-D seismic surveys and a concurrent 2-D seismic survey) was completed and concluded that the EA predictions from the original EA and its Amendments remained valid. However, the effects of three concurrent 3-D seismic surveys were not assessed. As such, this section focuses on the effects assessment of three simultaneous 3-D seismic surveys and a 2-D seismic survey by MKI in the Project Area on Valued Environmental Components (VECs) assessed in the original EA (and associated documents). From June to October 2017, MKI is planning to conduct 3 D seismic surveys in four different survey areas (Figure 2.1) using three seismic vessels, in waters ranging in depth from approximately 100 m to 2800 m. Two of the four 3-D survey areas (Harbour Deep and Cape Broyle) occur in shelf and slope waters whereas the other survey areas occur in slope waters.

Section 2.2 Mitigation Measures, pg 5 -- The use of an escort vessel, also known as a scout, picket, or chase vessel, has been identified as a mitigation measure to prevent negative interactions with fishers and others. The primary purpose of an escort vessel is to increase the forward looking range (both radar and visual surveillance) of the seismic vessel by travelling ahead on the planned data acquisition route. This action increases the amount of time available for gear/vessel avoidance by the seismic vessel and thus reduces the likelihood of a negative interaction between the seismic program and fishers.

When the absence of an escort vessel is unavoidable and prior to that absence, MKI will risk assess the conduct of the operation without the escort vessel present and plan and implement appropriate measures to reduce the likelihood of a negative interaction with fishers. The following mitigation measures are considered appropriate in the absence of an escort vessel and may be implemented, as required, to maintain safe operations and avoid negative interaction with fishers:

- maximize communication with commercial fishers in the area via the Fisheries Liaison Officer (FLO);
- maintain vigilant visual and radar watch from the seismic vessel;
- scout ahead with the escort vessel as far as appropriate and practical, prior to departure;
- plan the absence, when possible, for a time when the seismic vessel is operating in an area of least commercial fishing activity;
- move to an area of lesser fishing activity until the escort vessel returns; and/or
- suspend data acquisition and recover seismic equipment until the program can proceed without potential negative interaction with fishing activities.

In cases where an absence is unplanned [e.g. medical evacuation, other emergency], the seismic vessel will, as a minimum, maximize communication with fishers and maintain a high level of vigilance for visual and radar observation. Once the situation is under control, MKI will complete a risk assessment to determine what other mitigations, if any, are appropriate.

MKI Response: *MKI will implement the measures outlined above by the C-NLOPB during the infrequent periods the escort vessel is unavailable.*

Section 3.0 Cumulative, page 16 - The description provided is not adequate and requires additional details / information on other relevant marine project users (e.g. fishing activities, marine transportation, cruise ships). It should include a consideration of environmental effects that are likely to result from the proposed project in combination with other projects or activities that have been or will be carried out. Only with this information, combined with a prediction of future activity, can the statement "*Thus, it seems…the current prediction is that no significant residual effects will result*".

MKI Response: *Additional information on other relevant marine project users is provided for commercial shipping (including cruise ships) and fisheries. Oil and gas activities were detailed in Section 3 of the Amendment.*

Commercial Shipping

The original EA noted that "Overall, the expected density of commercial traffic in the southern extent of the Study Area is light to moderate, and light to very light in the northern extent." This was based on vessel density maps presented in The Grand Banks of Newfoundland Atlas of Human Activities (DFO 2007; see also Figures 5.78 and 5.79 in YOLO/RPS 2012). Since publication of the original EA, there is a paucity of newly available information on shipping in the Study Area.

A search for vessel traffic data and reports revealed the sources of information listed below. Each information source has limitations but where possible a summary of findings relative to the Study Area is provided.

- *The Canadian Coast Guard (CCG) maintains an Automatic Identification System (AIS) vessel tracking database consisting of vessel positions and relevant voyage data for ships approaching and operating in Canadian waters (CCG 2013). However, aside from internal CCG use, these data are only provided to other governmental departments, such as the Department of National Defence, and to the Marine Security Operations Centres (CCG 2013), and are not currently available for public or private use (e.g., see § 4.3.2.1 of the recently submitted EA for Nexen Energy ULC [Nexen 2017]).*
- *The Canadian Year-Round Shipping Traffic Atlas for 2013: Volume 1, East Coast Marine Waters (Simard et al. 2014) contains monthly vessel traffic density data for 2013 derived from CCG's AIS database. However, the data does not extend eastwards beyond 49ºW and includes almost no data for offshore Labrador; therefore, most of the MKI Study Area is not included in the Atlas. The traffic density maps do indicate that during May to November 2013, the highest traffic density occurred nearshore east and north of Newfoundland's Avalon Peninsula, particularly in the vicinity of St. John's, and south of the island of Newfoundland (and south of the Study Area). This generally agrees with the shipping information presented in the original EA. Offshore vessel tracks (within the field of view presented in Simard et al. 2014) were predominantly located south of 48ºN during May, June, October and November and overall vessel traffic increased during July, August and September (see Figures 118, 141, 164, 187, 210, 233 and 256 in Simard et al. 2014).*
- *A Marine Traffic (2017) website was accessed and provided information on real-time vessel locations as well as commercial vessel track lines from 2016. While it was possible to distinguish vessel track lines by vessel type (i.e., fishing vessel, tanker, cargo, container ships, passenger vessels), track lines were not available for individual months or a monthly/seasonal range. An examination of vessel track patterns generally supported the information provided in the original EA.*
- *In 2016, 20 cruise ships visited the Port of St. John's during the May to November period, with most visits (11) in September (R. Rose-Colbert, Economic Development, Culture & Partnerships Division, City of St. John's, pers. comm., 12 July 2017). Information on cruise ship routing through MKI's Study Area was limited. Representative cruise ship routes between May and November 2017/2018/2019 were approximated based on information from the following cruise lines: Adventure Canada (2017), Expedition and National Geographic (2017), Fred Olson Cruise Lines*

(2017), Hapag Lloyd Cruises (2017), Hurtigruten (2017a,b,c,d), and Oceania Cruises (2017). Many of the cruise ship trajectories planned between May and November 2017/2018 are located in the immediate vicinity of Newfoundland and Labrador, in order to facilitate port visits. Based on available information, relatively small numbers of cruise ships (e.g., Fred Olson Cruise Lines Rugged Rural Canada tour, MS Europa) are anticipated to transit through MKI's Study Area.

In summary, commercial shipping traffic through the Project Area is anticipated to range from very light to moderate depending on specific location. To mitigate potential interactions between commercial shipping and the Project, MKI's seismic and escort vessels constantly monitor shipping activity and communicate with other vessels when appropriate to ensure that appropriate separation distances are maintained for safe operations.

Fisheries

Fishing activity (commercial, traditional and aboriginal, and recreational) in the Project Area was recently summarized in the EA Update (2017b) for this Project and included the most recent commercial fisheries data (from 2015) available. As in previous years considered within the assessment period for this Project, during May–November 2015, snow crab (41% of total catch in the Study Area in terms of total catch weight quartile code counts) and Greenland halibut (23%) dominated the commercial catches in the Study Area, followed by redfish sp. (13%) and Atlantic halibut (8%). Within the Study Area, the majority of fishing activity occurs during the May to August period. Snow crab was primarily harvested in the southwest portion of the Study Area (see Figure 4.5 in LGL 2017b) in water depths of 100-200 m. Greenland halibut were primarily harvested between the 500 and 1,000 m isobaths in the central western portion of the Study Area (see Figure 4.6 in LGL 2017b). Catch distributions for redfish and Atlantic halibut during May to August 2015 are shown in Figures 4.7 and 4.8, respectively of LGL (2017b). In 2017 (i.e., the last year in the temporal scope of the Project), it is anticipated that the commercial harvest species, and the timing and locations of commercial fisheries within the Study Area will be similar to previous years.

Consideration of Combined Activities

The primary concern associated with seismic surveys in combination with other projects or activities in the Study Area is the effects of underwater noise on VECs. As discussed in §2.3 of the Amendment, the cumulative effects of seismic sound from simultaneous seismic surveys on fish and fish habitat, fisheries, seabirds, marine mammals, sea turtles, species at risk and sensitive areas are predicted to be not significant. However, there are uncertainties regarding these predictions, particularly including the effects of masking and disturbance on marine mammals, and the effects of disturbance on marine invertebrates and fishes from sound produced during multiple seismic surveys. Note that possible disturbance effects on marine invertebrates and fishes might not only impact key life history components but also commercial fisheries and science surveys. However, disturbance effects on fisheries are more readily mitigated primarily through communication and temporal and spatial avoidance of seismic surveys from fishing activity. The uncertainties with the effects of underwater noise increase with the number of seismic surveys and additional sources of underwater noise in the area (e.g., commercial shipping, fishing vessels, and oil developments). Noise from vessels and noise associated with offshore production and drilling are generally continuous (vs. pulsed sound from airguns) and at much lower sound levels. There is little potential for hearing impairment or physical effects on VECs associated with underwater noise

from vessels and offshore oil production. Any avoidance of vessels and offshore oil developments by VECs, including species at risk, is likely to be localized and temporary (e.g., see Section 6 of the original EA; YOLO/RPS 2012).

As discussed in the EA documents for this Project, negative effects (auditory, physical, and behavioural) on key sensitive VECs, such as marine mammals, appear unlikely beyond a localized area from the sound source. In addition, all seismic programs will use mitigation measures such as ramp-ups, delayed startups, and shut-downs of the airgun arrays as well as spatial separation between seismic surveys (minimum of 30 km). Seismic programs and other ocean users (commercial shipping, fishing, oil developments) will have to maintain an appropriate separation distance for safe operations. Marine mammal response (including species at risk) to commercial shipping noise is expected to be localized and temporary especially for vessels maintaining a constant course and speed, which is typical for transiting commercial vessels. Marine invertebrate and fish response to commercial shipping noise is also expected to be localized and temporary, especially given the much lower sound levels associated with commercial shipping. Thus, it seems likely that while some animals may receive sound from multiple seismic programs, other vessels, and oil developments in the Study Area, the current prediction is that no significant residual effects will result from exposure to underwater sound. The level of confidence associated with this prediction is rated as low to medium given the scientific data gaps.

Section 3.1 Follow-up Monitoring, page 18 – The Geophysical, Geological, Environmental and Geotechnical Program Guidelines were updated in April 2017.

MKI Response: *Noted. The new citation for C-NLOPB (2017) as follows.*

C-NLOPB. 2017. Geophysical, Geological, Environmental and Geotechnical Program Guidelines, April 2017. 57 p.

Fisheries and Oceans Canada (DFO)

Section 2.2 Mitigation Measures – Table 2.2 Summary of environmental commitments and mitigation measures, page 6 – for Marine Mammals, Sea Turtles and Species at Risk it is noted that start-up of the seismic array will be delayed and shut down if any marine mammals, sea turtles, or species at risk are observed within 500 m of the array and that Marine Mammal Observers will monitor marine mammals and sea turtles during daylight seismic operations and implement shut downs and ramps ups as appropriate. It is also noted in Section 2.3.4 (page 13) and Section 2.3.5 (page 14) that there is uncertainty with respect to effects of multiple simultaneous surveys leading to a noted low to medium level of confidence with the prediction of residual impacts (i.e. not significant) on marine mammals including species at risk. In recognition of this uncertainty and the possible/likely presence of marine mammal species at risk (e.g. northern bottlenose whales (Scotian Shelf and/or Labrador Sea population)) and in keeping with the precautionary approach provided for within the SOCP it is suggested that the operator be encouraged to

employ passive acoustic monitoring (PAM) to monitor marine mammal observation within 500 m of the seismic arrays during periods of low visibility and to reflect same within Table 2.2.

MKI Response: *MKI will follow and in several cases exceed the minimum requirements outlined in the* Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment. *MKI will use the ramp up procedure (i.e., gradual activation of the airguns in an array) during daylight periods of limited visibility and during periods of darkness (as well as all other periods). This procedure is intended to warn marine mammals, sea turtles and other marine fauna before they are exposed to the higher sound levels from the full airgun array. MKI will also operate a single airgun (lowest volume) during line changes. Once again, this measure is intended to decrease the likelihood that marine mammals and sea turtles would occur close to the airgun array during periods with and without limited visibility. MKI will also require that a ramp up occurs during the transition from a single airgun to the full array—this exceeds the requirement in the* Statement of Practice.

It is unclear at this stage which population (Scotian Shelf vs. Davis Strait-Baffin Bay-Labrador Sea) of northern bottlenose whales occurs offshore Newfoundland, including sightings made off the south coast and in the Flemish Pass area. Given this uncertainty and in accordance with Moors-Murphy and Theriault (2017), MKI has committed to implementing shut downs for all beaked whales (including northern bottlenose whales and Sowerby's beaked whales) that are detected within the 500 m safety zone. This exceeds requirements in the Statement of Practice. MKI has investigated the possibility of using commercially available PAM equipment aboard its seismic vessels. Currently, this equipment is limited in its ability to determine the location of a received marine mammal vocalization and to detect low-frequency calls from baleen whales (including at-risk species that require shut downs). MKI will continue to investigate PAM options for future survey work.

Section 3.1 Follow Up Monitoring, page 17 - the commitment to prepare and submit a comprehensive marine mammal and sea turtle monitoring report is a positive and welcomed commitment. If possible we would appreciate receiving a copy of this report.

MKI Response: *MKI will provide DFO with the monitoring report.*

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