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Our reference: EQ-CEAA-0075-2018

03 October 2018

Subject: Submission of Information Requirements and Required Clarifications Associated with the Flemish Pass Exploration Drilling Program: Round 2

Dear Ms. O'Brien,

Please find enclosed the responses to information requirements (IRs) and required clarifications (CLs) common to the Environmental Impact Statements (EIS) associated with the Flemish Pass Exploration Drilling Program (Equinor Canada Ltd.) and Eastern Newfoundland Offshore Exploration Drilling Project (ExxonMobil Canada Ltd.). Round 2 did not contain any IRs/CLs specific to Equinor's EIS.

Please contact the undersigned if you have questions regarding this submission.

Sincerely,

<Original Signed By>

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Responses to Information Requirements and Clarifications – Round 2

For
Flemish Pass Exploration Drilling Program
(CEAR 80129)

and

Eastern Newfoundland Offshore Exploration Drilling Project
(CEAR 80132)

pursuant to the *Canadian Environmental Assessment Act, 2012*

Equinor Canada Ltd.

ExxonMobil Canada Ltd.

October 2018

Responses to Information Requirements and Clarifications – Round 2

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COMMON INFORMATION REQUIREMENTS

EQUINOR AND EXXONMOBIL

INFORMATION REQUIREMENT – IR-05-2

To clarify a statement in EIS regarding use of multiple streamers for wellsite surveys, the Agency required the proponents to identify any components or activities that have been included in Section 2 of the EIS but that would not form part of the designated project under CEAA 2012 (e.g. 3D high resolution survey).

In response, the proponents' stated that no 3D seismic surveys are proposed. The Canada-Newfoundland and Labrador Offshore Petroleum Board noted that 3D seismic was included as one example of the types of activities requiring clarification. To ensure clarity on required authorizations and associated environmental assessment responsibilities, confirmation is required that the designated projects would not include surveys for the broader delineation of resources (including conventional 2D and 3D seismic), as set out in section 3.1 of the EIS Guidelines.

Specific Follow-Up Question/Information Requirement

Given the reference to multiple streamers in the original EIS and that 3D high resolution surveys were only provided as an example, confirm that multiple streamer geophysical surveys, including but not necessarily limited to conventional 2D and 3D seismic surveys, would not be included in the designated projects for Equinor and ExxonMobil, respectively.

Response

ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) confirm that multiple streamer geophysical surveys including, but not limited to, conventional 2D and 3D seismic surveys, would not be included in the designated projects.

References

N/A

INFORMATION REQUIREMENT – IR-07-2

The Agency required further information on the alternatives examined for waste management. In their response, the proponents indicated that the selection of cuttings disposal options (at sea, on shore, or re-injection) will be finalized during the Operations Authorization application process, with the preferred management option depending on drilling fluid selected. This contradicts Section 2.10.1.3 of the EIS, where disposal at sea was identified as the preferred option; on shore disposal and offshore reinjection were not carried through the effects assessment in the EIS.

Specific Follow-Up Question/Information Requirement

Clarify whether on shore disposal and offshore re-injection are still potential options for disposal of drill cuttings. If so, provide effects analysis, conclusions, mitigation and follow-up for potential effects of these alternatives on relevant valued components.

Response

The information outlined in Section 2.10.1.3 of the Environmental Impact Statement (EIS) associated with the preferred method of drilling waste management remains valid. ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) recognize that select information in the original response to this Information Requirement (IR) contradicts Section 2.10.1.3 of the EIS and confirms that the preferred option for drilling waste management is disposal at sea. On-shore disposal and offshore re-injection were determined to be unfeasible options from a technical perspective and were not carried through the EIS, therefore effects analysis, conclusions, mitigation, and follow-up for potential effects on relevant valued components (VC) are not applicable.

References

N/A

INFORMATION REQUIREMENT – IR-12-2

The Agency required further information on what volume of produced water would constitute the "large amount" referred to in the EIS. The proponents' responded that depending on volume, produced water may be flared, treated and discharged to sea or shipped to shore for treatment, and in all cases treatment would be in accordance with the Offshore Waste Treatment Guidelines. A "large amount" was not defined; rather, the proponents' indicated that the volume of produced water generated is influenced by the reservoir properties, and stated: "Flaring of a large volume of produced water cannot occur as it would cause the flare not to function properly, which has the potential to release hydrocarbons to the environment."

Specific Follow-Up Question/Information Requirement

Explain what is considered to be a "large volume" of produced water from formation flow testing, and how the potential for flare malfunction (and release of hydrocarbons) is identified and avoided. Indicate under what circumstances produced water would be treated, shipped to shore, or flared. Describe the potential effects of flaring produced water.

Response

Section 8.3.5 of the Environmental Impact Statement (EIS) describes several options associated with formation flow testing to include all possible scenarios; however, based on formation flow testing completed to date in the Flemish Pass by Equinor Canada Ltd. (Equinor) no produced water has been encountered. Formation flow tests target hydrocarbon zones, and therefore encountering produced water is not expected. If a water-bearing zone were encountered, the formation flow test would be discontinued, and another interval targeted.

The "large volume" referenced in the EIS is relative, and not easily quantifiable due to various design parameters that need to be considered. Given the above, the likelihood of encountering produced water is low, and therefore the discussion of volumes is not warranted. In the unlikely scenario that produced water is encountered and requires handling, surface separators are used to separate water and hydrocarbons prior to flaring. The separated produced water would be treated and disposed as per the Offshore Waste Treatment Guidelines (OWTG) (NEB et al 2010). Lastly, produced water could be shipped to shore if offshore treatment is not feasible due to high hydrocarbon content, or limited storage capacity on the drilling installation. As previously mentioned, produced water would not normally be flared other than the liquid droplets entrained in the flare gas, as mentioned in the response to Clarification (CL) CL-13. In addition, the flare is precisely calibrated for each operation and constantly monitored; in the event of a malfunction adjustments can be made quickly.

Due to all the factors listed above and given that the amount that potentially could be flared is so low, potential effects of flaring produced water are not required to be assessed.

References

NEB (National Energy Board), Canada-Nova Scotia Offshore Petroleum Board and Canada-Newfoundland and Labrador Offshore Petroleum Board. 2010. Offshore Waste Treatment Guidelines. Available online: https://www.cnlopb.ca/wp-content/uploads/guidelines/owtg1012e.pdf. Accessed September 2018.

INFORMATION REQUIREMENT – IR-16/16A-2

IRs 16 and 16a required an updated analysis of effects of the projects on Atlantic salmon, including a discussion of the need for follow-up related to project-specific or cumulative effects on Atlantic salmon. In their response, the proponents' indicated that although significant effects to Atlantic salmon are not anticipated as a result of project activities, there are data gaps regarding migratory routes of Atlantic salmon. The proponents' stated they may consider supporting research to address these data gaps, potentially in collaboration with research partners, Indigenous groups, or within the context of regional initiatives. The Agency understands that potential collaborations continue to be explored and additional information may now be available on future initiatives.

Specific Follow-Up Question/Information Requirement

Provide an update on research collaborations that have been identified, and agreements that are in place, if any to improve understanding of Atlantic salmon in the marine environment and their potential interaction with oil and gas activity in the of Newfoundland. Elaborate on the research areas that are being studied, by whom, how this data will/may improve certainty with respect to impact predictions, for the current and future projects, and how Indigenous groups may be engaged in developing research plans. Indicate how data will be disseminated, including whether results of research initiatives will be shared with other operators in Eastern Newfoundland offshore, Indigenous communities, and the public.

Response

Multiple collaborative efforts are being pursued to address knowledge gaps regarding Atlantic salmon migration. These include initiation of new potential studies with Petroleum Research Newfoundland and Labrador (PRNL), Environmental Studies Research Fund (ESRF), as well as participating in existing planned studies such as the Atlantic Salmon tagging program being completed by the Atlantic Salmon Federation (ASF). Discussions are ongoing with Indigenous organizations, such as the Unama'ki Institute of Natural Resources (UINR) and the Mi'kmaw Conservation Group (MCG), to generate a short list of potential research activities to address Indigenous concerns regarding knowledge / data gaps.

There are currently three results from this initiative, one short term and two longer term. The ASF is conducting a salmon tagging program of kelt in Greenland in the fall of 2018. The purpose of the tagging is to provide additional information regarding the migratory route of adult salmon from Greenland to the coastal waters of Canada. Equinor Canada Ltd. (Equinor) has purchased and provided the ASF with 18 additional tags. The data from the ASF program will add to the migration dataset, and the results will become available on their website. Equinor is currently considering deploying acoustic receiver(s) in the Flemish Pass area, which is within the Project Area. Locating acoustic receivers within the Flemish Pass area would provide additional data regarding proposed migration through this area.

Husky Energy has placed receivers on its SeaRose production facility, located on the Grand Banks, that will be able to detect signals from these tags, as well as others that pass within range, and this data will also contribute to the body of knowledge regarding salmon migration in this area.

The effects prediction in the Environmental Impact Statement (EIS) conservatively assumed that salmon migrate through the Project Area, although data on this matter are scarce. Results from this tagging study will provide additional data to help address this knowledge gap, and information regarding the migration routes of the tagged salmon in relation to the Flemish Pass area and may assist in the determination of whether this assumption is valid.

One of the longer-term initiatives that is being explored is through the ESRF, a national research program which sponsors environmental and social studies. The ESRF is designed to assist in the decision-making process related to oil and gas exploration and development on Canada's frontier lands. The funding for the ESRF is provided through levies on frontier lands paid by interest holders such as the oil and gas companies. The ESRF is directed by a joint government / industry / public management board and is administered by a secretariat which resides in the Office of Energy Research and Development, Natural Resources Canada. There is an open and transparent process to identify priority research areas and solicit proposals. The data gap related to the migratory route of Atlantic salmon in the far offshore (Project Area) has been discussed with the ESRF Secretariat and will be presented to ESRF at the fall management meeting as a potential new priority. Discussions are underway as to how studies to address this item might be included in the call for proposal mechanism that governs studies approved by the ESRF board.

Research funded by the ESRF is published and made publicly available on the ESRF website.

PRNL carries out a regular call for Research Proposals, but there are other funding mechanisms utilized:

- Expressions of Interest and Requests for Proposals are direct requests issued by Petroleum Research to address specific industry needs identified by members;
- Calls for Proposals are periodically issued by PRNL. Prospective proponents are requested to offer solutions to one or more challenges within a specified research focus area;
- Academic Research Funding is awarded by PRNL to faculty, students and postdoctoral fellows that are working in and learning about issues of interest to PRNL’s members; and,
- Unsolicited Proposals are accepted from firms or organizations that are seeking support to deliver research that is of value to our members.

For potential future studies through ESRF and PRNL, the specifics regarding study scope, Indigenous group involvement in developing study plans and the potential value of the study to effects assessments cannot be determined at this time as they are dependent on the specific study proposals received.

Equinor will provide the results of these studies to Indigenous groups.

References

N/A

INFORMATION REQUIREMENT – IR-20-2

The Agency required the proponents to identify the likely distance between wells, both exploration and delineation, assumed when stating that there was no potential overlap of effects of drilling muds and cuttings. The proponents' responded that delineation and appraisal wells are typically completed within a radius of approximately 20 km from the exploration well. Although this distance between wells makes overlapping effects of water-based mud cuttings deposition unlikely, the model predicted dispersion of synthetic-based mud cuttings up to 32 km or more from the wellsite, depending on location and season modelled. Overlap of synthetic-based mud cuttings deposition within exploration licences for each Project was not addressed in the EIS.

Specific Follow-up Question/Information Requirement

Quantify the potential area of overlap for zones of effects for synthetic-based mud cuttings deposition, taking into account the maximum number of wells proposed for each project. Update the effects assessment for relevant valued components, as well as potential mitigation and follow-up.

Response

ExxonMobil Canada Ltd. (ExxonMobil) indicated in the response to Information Requirement (IR) IR- 66 that the number of exploration wells that could be drilled on exploration licences (ELs) 1135 and 1137 may be up to five on each EL. Equinor Canada Ltd. (Equinor) indicated in the response to IR-71 that the number of exploration wells that could be drilled on ELs 1139, 1140, 1141, and 1142 may be up to two on each EL. As outlined in the responses to IR-66 and IR-71, the number of delineation / appraisal wells that ExxonMobil and Equinor (herein referred to as the Operators) could drill on each EL is not known, as delineation / appraisal wells would be dependent on results of the initial exploration wells.

In assessing the concern for overlap of the cuttings dispersion, it should be noted that the purpose of a delineation / appraisal well is to evaluate the potential size of a prospect; therefore, the delineation / appraisal wells will likely be some distance from the original exploration well to enable better estimates of resource size. Since many of the ELs are more than 100 square kilometres (km^2) it would be reasonable to assume that each EL could contain multiple prospects and that delineation / appraisal wells or additional exploration wells on an EL could be also considerable distance from the initial exploration well evaluating unrelated prospects.

Appendix G of the Environmental Impact Statement (EIS) outlines the drill cuttings modelling completed, which included four locations (i.e., NPA in EL 1140, EPA in EL 1142, SPA in EL 1135, and Jeanne d'Arc Basin [JDB] in EL 1137). Appendix A of ExxonMobil's recently submitted Addendum completed drill cuttings modelling for EL 1134.

As outlined in Appendix G of the EIS and Appendix A of ExxonMobil's Addendum for EL 1134, the majority of modelling locations / scenarios in deep water (i.e., Northern Project Area [NPA], Eastern Project Area [EPA], Southern Project Area [SPA], and EL 1134) resulted in the majority of synthetic-based mud (SBM) cuttings settling outside of the 32 kilometre (km) model domain; however, it is anticipated that SBM cuttings outside the model domain of 32 km would be highly dispersed and negligible in thickness. It is not feasible to assess the overlap of SBM as exploration well and delineation / appraisal well locations have not been selected. Due to SBM cutting thicknesses

predicted to be negligible, it is not anticipated that overlapping SBM cuttings will occur to a degree that exceeds the very conservative predicted no effects threshold (PNET) and therefore, the effects assessment for applicable valued components (VC), and potential mitigation and follow-up is not required.

As outlined in Appendix G of the EIS, the shallow water location (i.e., JDB) resulted in all SBM cuttings being deposited within the 32 km model domain. As outlined in Section 8.3.4.4.2 of the EIS, overall average thickness is low (0.4 millimetres [mm] or less); however, there are some areas outside 500 metres (m) that reach up to 3 mm. Due to the dispersion of SBM cuttings, any relatively higher accumulations within the model domain are spatially small, which reduces potential effects on fish and fish habitat, which is also discussed in Section 8.3.4.4.2 of the EIS. It is not feasible to assess the overlap of SBM as exploration well and delineation / appraisal well locations have not been selected. Based on the exploration and delineation / appraisal strategy outlined above, it is not anticipated that overlapping SBM cuttings will occur to a degree that exceeds the very conservative PNET and therefore the effects assessment for applicable VC, and potential mitigation and follow-up is not required.

References

N/A

INFORMATION REQUIREMENT – IR-23-2

IR-23 required the proponents to provide information on pre-drill coral and sponge surveys, including how the protocols outlined in the Monitoring of Drilling Activities in Areas with Presence of Cold Water Corals (Norwegian Oil and Gas 2013) would be applied, clarification on what would be included as sensitive marine habitat, potential mitigation measures, subsea cutting transport systems, and the sharing of information collected.

In their response, the proponents' stated that coral and sponge surveys would be conducted at each well location, as well as 50 metres around each anchor pattern. Coral and Sponge Survey Plans, as well as resulting Coral and Sponge Survey Results and Risk Assessment Reports, would be provided to the C-NLOPB and the DFO for review and acceptance. The proponents' indicated that the Norwegian Guidelines would be modified, as necessary to take account of the local environment and needs.

IR-79 further required information on how proposed surveys using multi-beam echo sounders (MBES) and side scan sonar (SSS) would detect species such as sea pans, bamboo corals and various sponges, the feasibility of conducting a pre-drill survey with ROV around each wellsite prior to drilling to confirm predications made based on the results of the MBES and SSS surveys, and how coral and sponge aggregations would be defined for pre-drill surveys.

The proponents responded that MBES and SSS data may be used to map seabed characteristics and morphology and identify areas where cold water corals may be located, and that these areas may be further inspected (ground-truthed) using equipment such as a remotely operated vehicle equipped with a high definition camera. The proponents indicated that because sponges cannot be detected with MBES/SSS, visual data would be collected in areas where seabed contact is likely, thereby ensuring detection of these species. The proponents provided a list of information to be included in coral and sponge survey plans and subsequent risk assessments and indicated that DFO would be consulted on site-specific survey plans and risk assessments for each potential wellsite. No information was provided on how coral and sponge aggregations would be defined for risk assessment purposes.

The Agency understands that both ExxonMobil and Equinor plan to undertake baseline coral and sponge surveys in some areas of their respective ELs in the coming weeks.

Specific Follow-Up Question/Information Requirement

Provide the Agency with the following information related to the proposed coral and sponge surveys and associated mitigation planning:

- confirm which technologies would be used and under what circumstances;
- when and where the surveys will be conducted;
- the distance from each wellsite and/or mooring to be surveyed and how the results of the drill cuttings dispersion modelling and water depth would be applied to determine the distance to be surveyed;
- the specifications and capabilities for the remotely operated vehicle and its range from the platform, given that the zone of impact around a platform can extend some distance;
- the number of transects to be surveyed at each wellsite and anchor point, including diagrams of the transect pattern;

- who will review the investigation results;
- who the seabed survey results, including video footage, would be communicated to and in what manner; and
- how the results will be used and interpreted to inform potential mitigation for Eastern Newfoundland Offshore Exploration Drilling Project/Flemish Pass Exploration Drilling Project. Discuss the proposed methodology for coral and sponge risk assessments, including an indication of how significant aggregations of corals or sponges will be defined, and a description of the type of analysis used to qualify and/or quantify risk.

Response

As outlined in Section 2.5.2.1 of the Environmental Impact Statement (EIS), the original response to this Information Requirement (IR), as well as the response to IR-21, ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) will prepare *Coral and Sponge Survey Plans* for individual surveys and submit to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) and Fisheries and Oceans Canada (DFO) for their review and acceptance prior to implementing the survey. As outlined in the response to IR-79, the *Coral and Sponge Survey Plans* will contain detailed, site-specific information which may include the following:

- Survey methodology (e.g., equipment used and specifications, resolution, and remotely operated vehicle [ROV] targets);
- Survey schedule (e.g., anticipated start date and duration);
- Survey team (e.g., geophysical mapping technician, ROV technicians, and marine biologists / scientists);
- Survey area around the wellsites, mooring and anchors, and rationale for determining the survey area (i.e., using information from the drill cuttings dispersion modelling);
- Documentation (e.g., species, abundance, condition, size, and substrate conditions).

If corals and sponges and are identified, then a risk assessment will be completed, which may include aspects such as size, abundance, degree of exposure, and condition, which is indicated in Section 2.5.2.1 of the EIS, the original response to this IR, as well as the responses to IR-21 and IR-79. Sections 2.5.2.1, 8.3.4.5, and 8.6 of the EIS also outline the commitment to prepare a report that summarizes the survey results, risk assessment, and mitigation measures, if applicable; the report is referred to as the *Coral and Sponge Survey Results and Risk Assessment Report*, which will be submitted to the C-NLOPB and DFO for their review and acceptance prior to commencing drilling. This commitment associated with the *Coral and Sponge Survey Results and Risk Assessment Report* is also outlined in the original response to this IR, as well as the responses to IR-21 and IR-79.

The Operators are committed to preparing *Coral and Sponge Survey Plans* and *Coral and Sponge Survey Results and Risk Assessment Reports* for surveys that occur over the temporal scope of the EIS (i.e., 10 years for Equinor and 12 years for ExxonMobil). As outlined in the response to IR-79, this approach allows the Operators the opportunity to improve and refine their processes over time, which supports continual improvement on this relatively new topic, and ensures that the C-NLOPB and DFO are reviewing site-specific survey plans and results / risk assessment reports in an efficient and effective manner.

The information requested in this IR is outlined below; however, it is noted that the information below is subject to change as survey and risk assessment requirements may be refined and improved over Project duration (i.e.,10 to 12 years) due to technology development, experience gained from operations, scientific research is published and further data are collected, which is outlined in Section 2.5.2.1 of the EIS and the response to IR-79.

Part 1: Confirm which technologies would be used and under what circumstances.

As outlined above, and in the response to IR-79, equipment used, along with their specifications, to conduct coral and sponge surveys will be outlined in the *Coral and Sponge Survey Plans*, which are provided to the C-NLOPB and DFO for review and acceptance prior to conducting the survey. The response to IR-79 outlines the current technologies that may be considered for coral and sponge surveys. The response to IR-23 provides information associated with a potential technology that could be used as mitigation measure, if deemed required by the risk assessment (i.e., subsea cuttings transport system [CTS]).

Part 2: When and where the surveys will be conducted.

As outlined in Section 2.7 of the EIS, coral and sponge surveys will occur at least three months prior to drilling activities. As outlined in Section 1.2.2 of the EIS, and the responses to IR-66, IR-71, and IR-20-2, specific well locations for the duration of the Project (i.e., 10 to 12 years) have not been selected. Coral and sponge surveys will be conducted around the wellsites and anchor patterns, if applicable, in the applicable exploration license (EL) and will be outlined in the *Coral and Sponge Survey Plans*, which will be provided to the C-NLOPB and DFO for review and acceptance prior to commencing to survey.

ExxonMobil conducted field work in summer 2018 to collect baseline coral and sponge survey data in EL 1134 and EL 1135. ExxonMobil developed a *Coral and Sponge Survey Plan*, which was submitted to the C-NLOPB and DFO for review and acceptance prior to implementing the survey.

Part 3: The distance from each wellsite and/or mooring to be surveyed and how the results of the drill cuttings dispersion modelling and water depth would be applied to determine the distance to be surveyed.

The survey area around each wellsite is site-specific and will be determined by taking into consideration results of drill cuttings modelling in Appendix G of the EIS and Appendix A of the ExxonMobil EL 1134 Addendum. As indicated in the Appendices, drill cuttings modelling was not completed for all ELs; however, modelling locations were selected to account for water depth variation across the Project Area. Survey areas may be determined by taking into consideration aspects such as, but not limited to, seasonal variation, maximum cuttings thickness and areas where the predicted no effects threshold (PNET) was exceeded.

As outlined in Sections 2.5.2.1 and 8.5.1 of the EIS, as well as the responses to IR-21 and IR-23, the survey area around proposed anchor patterns will extend approximately 50 metres (m) from the anchor pattern line. During the survey, a single line will be surveyed to represent a mooring pattern as the exact mooring lines / pattern have not been finalized. This methodology will allow a representative sample in the area.

Proposed survey areas associated with wellsites and anchor patterns, if applicable, will be outlined in the *Coral and Sponge Survey Plans*, which will be provided to the C-NLOPB and DFO for review and acceptance prior to commencing to survey.

Part 4: The specifications and capabilities for the remotely operated vehicle and its range from the platform, given that the zone of impact around a platform can extend some distance.

Coral and sponge surveys will likely be completed from a vessel (rather than a drilling installation or platform) at least three months prior to drilling activities, as outlined in Section 2.7 of the EIS. Use of a vessel for these operations enables the vessel to move with the ROV, and therefore capture the intended range of the survey. In some instances, the surveys may be undertaken from the drilling installation and the survey design will account for any limitations in ROV manoeuvrability from the installation. The Operators recognize that ROVs are tethered; however, surveys are typically completed from vessels to allow mobility, thereby ensuring that the defined area can be surveyed.

Part 5: The number of transects to be surveyed at each wellsite and anchor point, including diagrams of the transect pattern.

The number of transects and applicable patterns are site-specific and are dependent on the drill cuttings dispersion field from the completed modelling and anchor pattern, if applicable. The number of transects and applicable patterns will be outlined in in the *Coral and Sponge Survey Plans*, which will be provided to the C-NLOPB and DFO for review and acceptance prior to commencing to survey.

Part 6: Who will review the investigation results.

As outlined in Section 2.5.2.1 of the EIS and the response to IR-79, a Marine Biologist / Scientist will be a part of the survey team on the vessel during the survey. As further indicated in Section 2.5.2.1 of the EIS, this position will be contracted; the contractor will act as an independent, qualified professional with specialty knowledge of cold water benthic habitat and will be responsible for the identification and assessment of coral and sponges. The Operators can provide copies of resumes associated with the selected Marine Biologists / Scientists, if requested by the C-NLOPB and/or DFO.

Part 7: Who the seabed survey results, including video footage, would be communicated to and in what manner.

As outlined in the original response to this IR, the Operators will prepare *Coral and Sponge Survey Results and Risk Assessments Reports*, which will be provided to the C-NLOPB and DFO. Similarly, the original response to this IR mentioned that C-NLOPB and/or DFO can request survey footage from the Operators. The Operators will also share survey footage and/or results with Indigenous groups and/or stakeholders, if requested.

Part 8: How the results will be used and interpreted to inform potential mitigation for Eastern Newfoundland Offshore Exploration Drilling Project/Flemish Pass Exploration Drilling Project. Discuss the proposed methodology for coral and sponge risk assessments, including an indication of how significant aggregations of corals or sponges will be defined, and a description of the type of analysis used to qualify and/or quantify risk.

As outlined in responses to IR-79, the Operators will prepare *Coral and Sponge Survey Results and Risk Assessment Reports* for individual surveys, which will be submitted to the C-NLOPB and DFO

for review and acceptance prior to drilling. Detailed information in the *Coral and Sponge Survey Results and Risk Assessment Reports*, as outlined in the response to IR-79, may include the following:

- Overview of the survey results including mapping;
- Risk assessment based on data collected, predicted degree of sedimentation, and predicted physical contact;
- Proposed mitigation measures (e.g., relocating the wellsite, redirecting cuttings); and
- Proposed monitoring requirements.

As outlined in Section 2.5.2.1 of the EIS, the Operators are proposing to use a similar risk assessment approach as outlined in the *Monitoring of Drilling Activities in Areas with Presence of Cold Water Corals* (NOROG 2013); however, the risk assessment approach may be adjusted to ensure suitability for species present in offshore Newfoundland. As outlined in the original response to this IR, several factors will be considered to determine if mitigation measures are required, which will be detailed in the *Coral and Sponge Survey Results and Risk Assessment Reports*, and include, but are not limited to:

- Area of reef-building coral;
- Percentage of living reef-building coral;
- Number of living soft corals per a defined area;
- Condition (health) of hard and soft corals;
- Percentage of sponge coverage;
- Predicted degree of sedimentation; and
- Predicted degree of physical contact.

References

NOROG (Norwegian Oil and Gas Authority). 2013. Guideline - Monitoring of Drilling Activities in Areas with Presence of Cold Water Corals. Available online: https://www.norskoljeoggass.no/contentassets/13d5d06ec9464156b2272551f0740db0/monitori ng-of-drilling-activities---areas-with-cold-water-corals.pdf. Accessed September 2018.

INFORMATION REQUIREMENT – IR-25-2

The Agency required additional information on potential effects of vessel traffic on marine mammals. The proponents' response indicated that observations for marine mammals and sea turtles will be conducted during offshore activities and speed will be adjusted as necessary when marine mammals and/or sea turtles are observed in close proximity to the installation.

Specific Follow-Up Question/Information Requirement

Provide information on who will be responsible for the marine mammal observations, the training protocol for those responsible for observations, if observations will be conducted on both vessels and drilling installations, and the reporting of findings.

Response

As outlined in Section 10.3.2 of the Environmental Impact Statement (EIS), trained marine mammal observers (MMOs) will be used to monitor and report on marine mammals and sea turtle sightings during vertical seismic profiling (VSP) and geophysical surveys where geophysical source arrays are used. ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) recognize that information in the original response to this Informative Requirement (IR) contradicts information outlined in Section 10.3.2 of the EIS and clarifies that MMOs will not be used on drilling installations or on service and supply vessels, as these activities do not use geophysical source arrays.

The Operators have not selected MMOs for applicable future activities; however, it is anticipated that third-party representatives will be responsible for marine mammal and sea turtle observations. Third-party representatives are selected based on their qualifications, which may include education, training, and experience. The Operators are aware that the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) has requested copies of resumes of MMOs for past offshore programs to ensure that operators are hiring appropriate people.

As outlined in Section 10.6 of the EIS, a report will be submitted annually to the C-NLOPB and Fisheries and Oceans Canada (DFO), including documentation of marine mammal and sea turtle observations during VSP and geophysical surveys where geophysical source arrays are used.

References

N/A

INFORMATION REQUIREMENT – IR-30-2

The Agency required the proponents to confirm whether a follow-up program would be undertaken with a systematic protocol to search for and document stranded birds on the drilling unit and supply vessels, and whether ECCC will be engaged in seabird observation training.

In their response, the proponents indicated that training will be provided under the Eastern Canada Seabirds at Sea (ECSAS) protocol. However, ECCC has pointed out that the ECSAS protocol is intended for conducting surveys of live birds at sea, not stranded birds on the platforms or vessels. In addition, the proponents did not indicate whether ECCC would be involved in seabird observation training.

The proponents' response referred to obtaining information on rates of stranding and mortalities through surveys completed under the Seabird Handling Permit from ECCC CWS. However, ECCC has noted that the Seabird Handling Permit does not provide a survey protocol on how to conduct and report on systematic searches of the platform for stranded birds.

Specific Follow-Up Question/Information Requirement

Provide information on the protocols to be developed for systematic searches of the platform for stranded birds, including frequency of searches and reporting procedures, and the training of observers responsible for monitoring and handling stranded birds. Indicate whether ECCC will be involved in seabird observation training.

Response

ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) acknowledge the above comments from Environment and Climate Change Canada (ECCC) regarding the Eastern Seabirds at Sea (ECSAS) protocol and *Seabird Handling Permit* not containing information pertaining to bird searches and training.

In lieu of outlining a proposed observation protocol in the response to this Information Requirement (IR), the Operators are proposing to develop a seabird observation protocol applicable to exploration drilling activities in consultation with ECCC-Canadian Wildlife Service (CWS) prior to commencing the first exploration drilling program. It will be determined at a later date if the Operators will prepare separate or consolidated observation protocols, as it will depend on the timing of respective exploration drilling activities.

For past offshore activities completed by Equinor, seabird observers have been trained in the ECSAS protocol by third-party providers, and it is anticipated that this practice will continue for future offshore activities. Seabird observers would also familiar with the requirements outlined in the protocol that will be developed, which is discussed above.

Information outlined in the seabird observation protocol will be determined in consultation with ECCC-CWS, and aspects such as frequency of searches, reporting procedures, and training requirements will be included.

References

N/A

INFORMATION REQUIREMENT – IR-39-2

The Agency required updated tables and a related figure with listings of all special areas that could be affected by the Projects. This requirement was intended to update the table and figure already provided in the EIS with information on the additional special areas identified by Fisheries and Oceans Canada in IR-39. The proponents' response provided a table and figures specific to those additional special areas.

Specific Follow-Up Question/Information Requirement

Consolidate the information from the EIS, IR-39 and also the EIS Addendum for the addition of exploration licence 1134 to provide one table and one figure depicting distances to special areas that could be affected by the Projects.

The figure, similar to Figure 11-2 in the EIS, should depict all the special areas that overlap with the project area as well as with the potential vessel and aircraft routes. The figure should also include any special areas that, while not directly overlapping with the project area or vessel and aircraft routes, may be within the zone of influence for effects of routine Project activities.

Provide a table, as per Table 6 in IR-39 and Table 4.17 of ExxonMobil's EIS Addendum for the addition of exploration licence 1134, of all special areas within the Regional Study Area and the distance of each of those special areas to the exploratory licences included in the Projects.

Response

Table 1 and Figure 1 below consolidates information from the Environmental Impact Statement (EIS), Table 6 from the original response to this Information Requirement (IR) and Table 4.17 from EIS Addendum associated with the ExxonMobil Canada Ltd. (ExxonMobil) exploration license (EL) 1134. Figures 1 and 2 also outline the zones of influence (ZOI) associated with drill cuttings, light and noise, which is also applicable for the response to IR-40-2. For details associated with ZOI refer to the response to IR-40.

Table 1 Special Areas in the RSA: Minimum Distances from Project ELs

Special Area	Project ELs - Minimum Distance (in km)						
	1134	**1135**	**1137**	**1139**	**1140**	**1141**	**1142**
Marine Protected Areas (MPA) and Areas of Interest (AOI)							
Eastport – Duck Islands MPA	512	466	385	521	563	565	544
Eastport – Round Island MPA	517	473	387	532	576	576	555
Laurentian Channel AOI	733	708	585	839	893	879	845
Gilbert Bay MPA	861	804	780	735	771	798	810
Newfoundland and Labrador Shelves EBSAs							
Orphan Spur	280	222	237	207	248	255	248
Notre Dame Channel	475	422	377	424	466	475	467
Fogo Shelf	489	439	377	463	504	511	498
Grey Islands	593	542	484	549	590	599	591
Gilbert Bay	832	775	751	707	744	770	782

Table 1 Special Areas in the RSA: Minimum Distances from Project ELs

Special Area	Project ELs - Minimum Distance (in km)						
	1134	**1135**	**1137**	**1139**	**1140**	**1141**	**1142**
Labrador Marginal Trough	739	680	684	572	604	637	656
Labrador Slope	656	597	619	472	500	537	559
Hamilton Inlet	898	840	830	745	777	809	827
Southern Pack Ice	NA	NA	NA	NA	NA	NA	NA
Refined PB/GB LOMA EBSAs							
Northeast Slope	72	14	67	111	167	148	114
Virgin Rocks	225	205	77	360	416	395	355
Lilly Canyon-Carson Canyon	165	211	124	391	443	410	343
Southeast Shoal	306	338	225	519	573	543	481
Eastern Avalon	367	327	219	435	488	477	446
Southwest Slope	485	506	374	672	728	705	658
Smith Sound	469	424	336	492	538	536	513
Placentia Bay	503	462	357	559	609	602	574
Laurentian Channel	706	682	558	815	869	856	821
Haddock Channel Sponges	523	500	375	637	692	676	641
South Coast	761	717	614	800	847	845	820
St. Mary's Bay	477	437	329	544	595	586	555
Bonavista Bay	484	438	355	481	523	526	511
Baccalieu Island	374	330	238	406	454	451	425
Marine Refuges							
Northeast Newfoundland Slope Closure	98	40	113	93	141	137	112
Hawke Channel Closure	723	665	665	568	602	632	649
Funk Island Deep Closure	473	420	375	426	468	475	466
Canadian Fisheries Closures (FCA) within the EEZ							
Eastport Lobster Management Area	498	453	370	509	552	553	532
Funk Island Deep Box	473	420	375	426	468	475	466
Hawke Box	723	665	668	568	602	632	649
Lobster Area Closures							
Mouse Island	666	619	545	645	686	692	680
Glover's Harbour	655	607	533	633	675	681	668
Gander Bay	587	539	469	568	610	614	601
Gooseberry Island	501	458	363	534	580	578	553
Penguin Islands	748	707	602	794	841	837	812
Snow Crab Stewardship Exclusion Zones							
Crab Fishing Area 5A (2 zones)	435	423	345	477	521	521	500
Crab Fishing Area 6A (2 zones)	404	398	309	473	521	517	492
Crab Fishing Area 6B	385	342	245	432	481	475	447
Crab Fishing Area 6C	370	331	225	434	487	476	445
Crab Fishing Area 8A	393	355	244	477	530	517	483
Crab Fishing Area – 8BX	106	84	**X**	258	313	286	234

Table 1 Special Areas in the RSA: Minimum Distances from Project ELs

Special Area	Project ELs - Minimum Distance (in km)						
	1134	**1135**	**1137**	**1139**	**1140**	**1141**	**1142**
Crab Fishing Area 9A (2 zones)	492	464	344	593	629	634	599
Near Shore (2 zones)	367	328	222	431	483	473	442
Preliminary Representative Marine Areas							
Virgin Rocks	229	198	79	345	402	382	343
South Grand Bank Area	251	292	186	474	526	495	429
Northwestern Conception Bay	423	379	287	456	504	500	475
Southern Coast of Burin Peninsula and Southeastern Placentia Bay	618	578	469	683	734	726	696
Migratory Bird Sanctuaries							
Terra Nova	526	481	396	540	583	584	562
Ile aux Canes	722	670	617	655	696	710	708
Shephard Island	728	675	623	659	699	714	713
Coastal National Parks and Historic Sites							
Cape Spear National Historic Site	414	373	269	471	522	514	484
Signal Hill National Historic Site	418	377	274	473	524	516	487
Ryan Premises National Historic Site	468	423	342	479	523	523	502
Castle Hill National Historic Site	516	476	369	577	628	620	590
Terra Nova National Park	506	469	379	522	565	566	545
Coastal Provincial Ecological Reserves							
Witless Bay Seabird Ecological Reserve	427	387	280	495	547	537	506
Baccalieu Island Seabird Ecological Reserve	433	389	298	465	512	509	484
Mistaken Point Fossil Ecological Reserve	463	428	314	551	605	592	558
Funk Island Seabird Ecological Reserve	520	468	417	475	516	524	515
Cape St. Mary's Seabird Ecological Reserve	537	499	389	612	664	653	622
Lawn Bay Seabird Ecological Reserve (Middle Lawn, Swale, and Colombier Islands)	643	604	495	707	758	750	721
Fortune Head Fossil Ecological Reserve	660	621	513	718	768	762	733
Coastal Provincial Parks and Protected Areas							
Marine Drive Provincial Park Reserve	428	386	287	476	526	519	492
Chance Cove Provincial Park	449	412	300	533	587	574	541
Dungeon Provincial Park	467	421	341	477	520	521	500
Bellevue Beach Provincial Park Reserve	499	457	355	548	597	591	564
Gooseberry Cove Provincial Park	527	487	379	593	644	635	605
Windmill Bight Provincial Park Reserve	521	473	405	505	547	550	535
Deadman's Bay Provincial Park	533	485	417	515	556	560	546
Frenchman's Cove Provincial Park	625	585	478	681	730	724	696

Table 1 Special Areas in the RSA: Minimum Distances from Project ELs

Special Area	Project ELs - Minimum Distance (in km)						
	1134	**1135**	**1137**	**1139**	**1140**	**1141**	**1142**
Dildo Run Provincial Park	611	563	493	587	629	635	622
Coastal Provincial Historic Sites							
Cape Bonavista Lighthouse Historic Site	468	423	343	477	520	521	500
Heart's Content Cable Station Historic Site	472	429	332	514	562	557	531
UN Convention on Biological Diversity EBSAs							
Labrador Sea Deep Convection Area	1,000	1,036	1,076	869	886	930	961
Seabird Foraging Zone in the Southern Labrador Sea	250	202	318	**X**	13	56	88
Orphan Knoll	293	252	365	38	27	77	113
Slopes of the Flemish Cap and Grand Bank	**X**	**X**	98	15	**X**	**X**	**X**
UN FAO Vulnerable Marine Ecosystems (VMEs)							
Northeast Shelf and Slope (within Canadian EEZ)	64	15	92	107	162	147	117
Sackville Spur	107	62	205	15	2	**X**	**X**
Northern Flemish Cap	130	109	263	61	54	**X**	**X**
Southern Flemish Pass to Eastern Canyons	**X**	38	104	208	252	210	142
Beothuk Knoll	36	93	151	259	299	252	186
Deep Water Coral Area	138	185	255	317	310	258	224
Flemish Cap East	239	250	376	287	260	211	197
South East Shoal and Adjacent Shelf Edge / Canyons	295	343	224	521	576	541	473
Division 3O Coral Closure	524	545	415	712	768	745	694
NAFO Fisheries Closure Areas (FCAs)							
Tail of the Bank (1)	293	347	262	525	575	540	471
Flemish Pass/Eastern Canyon (2)	**X**	15	106	184	230	195	127
Beothuk Knoll (3)	95	154	192	316	353	300	238
Eastern Flemish Cap (4)	203	219	340	282	256	207	193
Northeast Flemish Cap (5)	215	202	356	146	104	69	92
Sackville Spur (6)	109	65	210	34	19	**X**	**X**
Northern Flemish Cap (7)	154	135	289	96	83	28	27
Northern Flemish Cap (8)	174	150	303	78	56	2	17
Northern Flemish Cap (9)	151	125	277	67	61	6	**X**
Northwest Flemish Cap (10)	59	35	190	79	112	68	**X**
Northwest Flemish Cap (11)	21	26	165	148	187	143	75
Northwest Flemish Cap (12)	113	88	242	77	98	46	**X**
Beothuk Knoll (13)	73	122	195	276	312	258	197
Eastern Flemish Cap (14)	205	207	349	211	177	130	127
Orphan Knoll Seamount	298	248	345	46	46	94	131

Table 1 Special Areas in the RSA: Minimum Distances from Project ELs

Special Area	Project ELs - Minimum Distance (in km)						
	1134	**1135**	**1137**	**1139**	**1140**	**1141**	**1142**
Newfoundland Seamounts	305	371	344	537	574	518	459
Fogo Seamounts (1)	634	663	540	840	895	867	807
Fogo Seamounts (2)	720	764	654	944	996	965	898
30 Coral Area Closure	524	542	411	707	763	740	693
Important Bird Areas (IBAs)							
Quidi Vidi Lake	417	376	273	472	522	514	485
Witless Bay Islands	423	383	276	490	542	532	501
Cape St. Francis	422	380	282	467	517	511	483
Baccalieu Island	430	386	295	462	509	506	481
Grates Point	436	392	301	467	514	510	486
Mistaken Point	453	419	304	545	598	585	551
The Cape Pine and St. Shotts Barren	486	451	336	572	626	613	580
Placentia Bay	506	466	360	567	618	610	580
Terra Nova National Park	506	461	377	519	562	563	542
Funk Island	514	462	410	468	510	518	509
Cape Freels Coastline and Cabot Island	507	459	389	493	534	537	522
Cape St. Mary's	527	489	378	602	654	644	613
Wadham Islands and adjacent Marine Area	546	496	434	514	556	562	551
Corbin Island	611	572	463	675	725	718	688
Middle Lawn Island	643	604	495	708	758	750	721
Green Island	679	639	531	741	791	784	755
UNESCO World Heritage Sites (WHSs)							
Mistaken Point Ecological Reserve	461	427	312	551	605	591	558
Red Bay National Historic Site	830	775	734	734	772	793	799
L'Anse aux Meadows National Historic Site	767	712	673	672	711	731	736
Note: X indicates that the EL and special area intersect.							

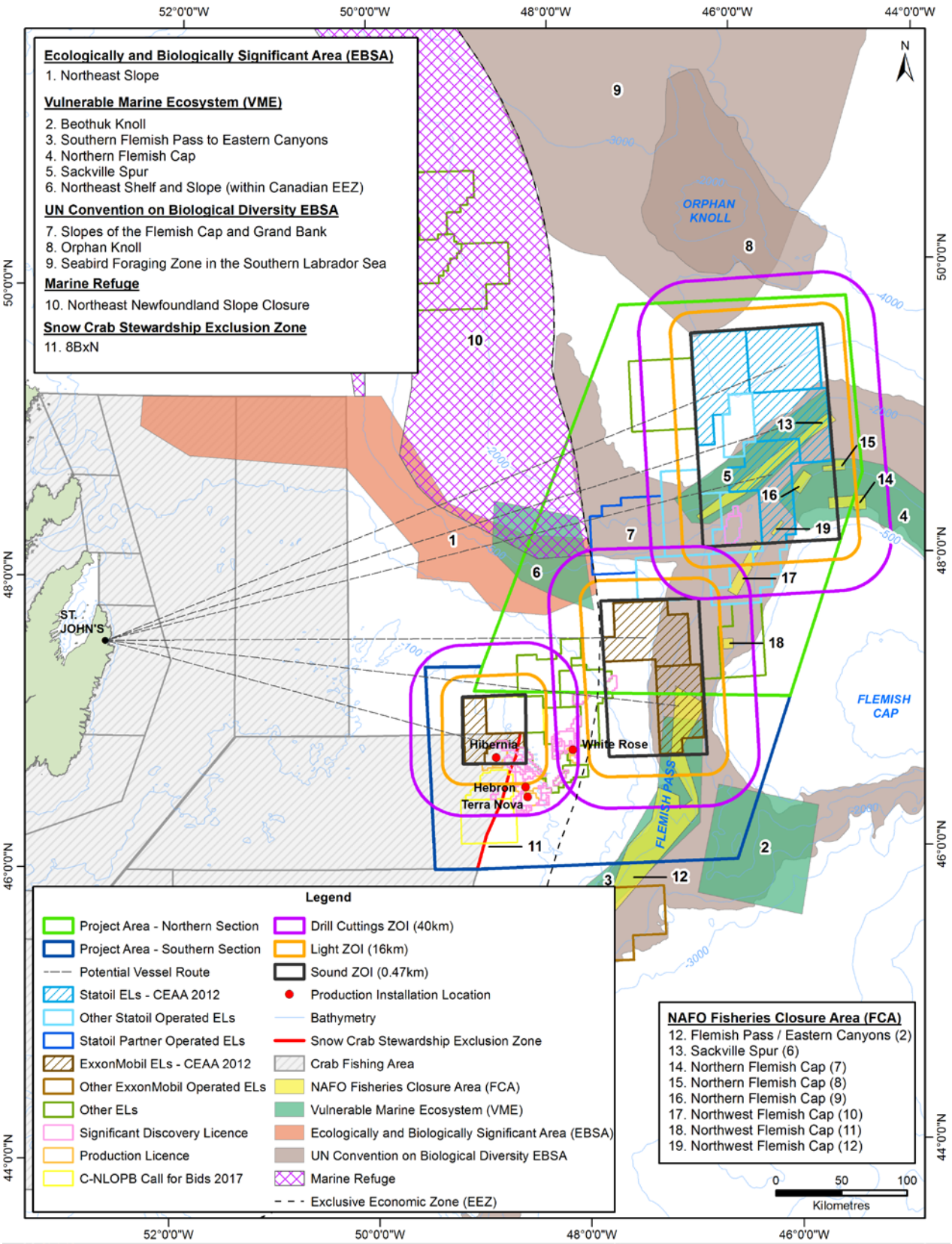


Figure 1 Special Areas Intersecting with Project Area ELs and Zones of Influence

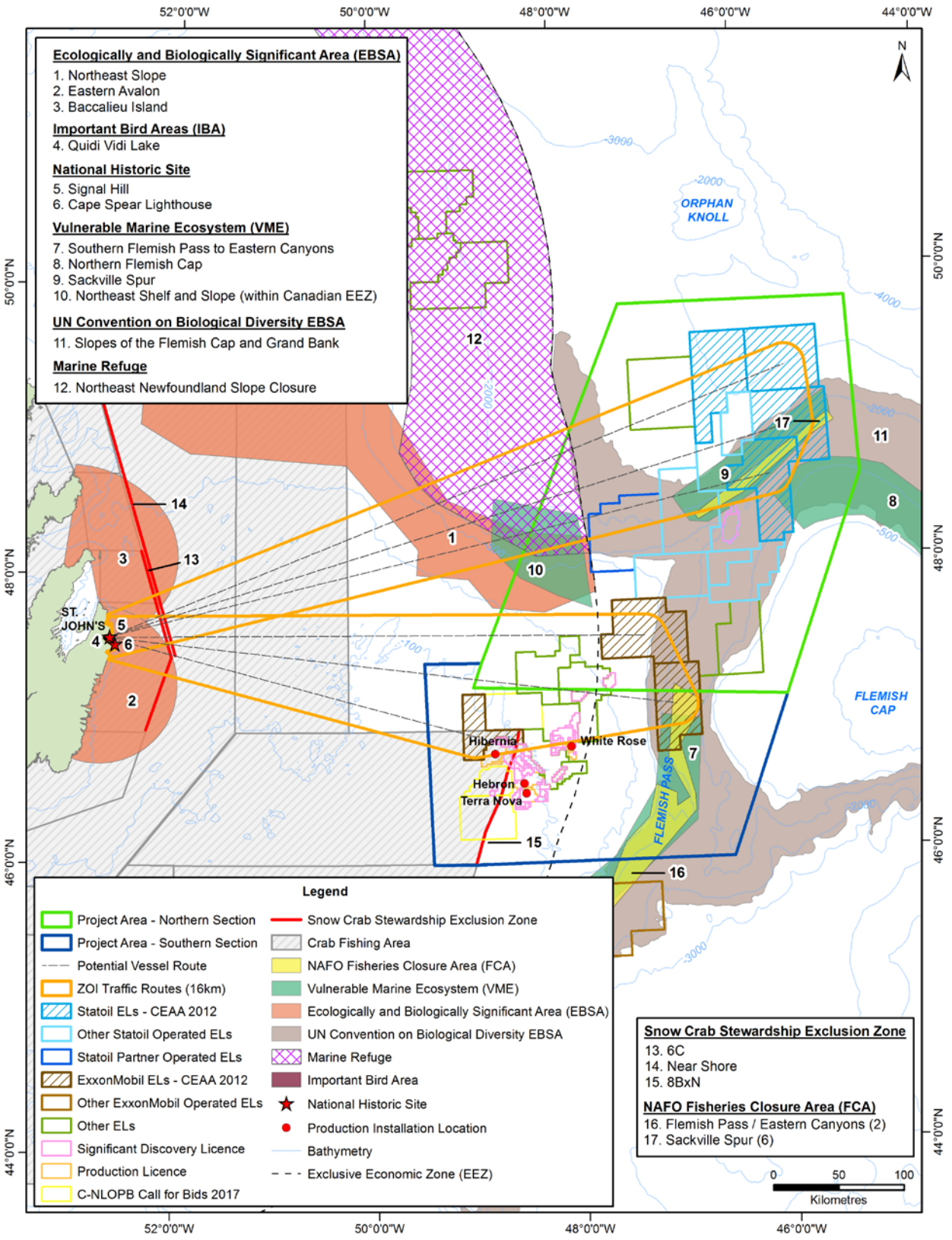


Figure 2 Special Areas Intersecting with the Potential Vessel and Aircraft Traffic Routes and Zones of Influence

References

N/A

INFORMATION REQUIREMENT – IR-40-2

The Agency required the proponents to assess the potential environmental effects of routine Project operations (e.g. noise, light, water, sediment) on special areas that are both overlapping with the Project and on those to which potential effects may extend. It is not clear whether the potential effects on special areas outside the ELs but within the potential zones of influence for noise, light, and cuttings disposal have been assessed.

The proponents' response focused on the potential environmental effects on special areas that are overlapping with the exploration licences associated with the Projects. Although effects of supply and servicing were discussed, special areas overlapping with vessel and aircraft transit routes were not identified; only those overlapping with ELs were included in the assessment (as per Table 11.4 in the IR-40 response).

Specific Follow-Up Question/Information Requirement

Clarify how the analysis considered potential zones of influence of noise, light and routine discharges when identifying the special areas that could be affected by routine operations. If there is potential for effects to extend to special areas not already discussed in IR-40, provide an analysis of effects of routine project operations on special areas that, while not directly overlapping the project area or vessel and aircraft transit routes, may be within the zone of influence for effects from noise, light, and drill cuttings disposal.

Further to the updated map and table required in IR-39-2, ensure that the analysis of effects of supply and servicing identifies the special areas that could interact (if any) with the Projects along or nearby potential vessel and aircraft transit routes and include this information in a consolidated list of special areas that could overlap with the Projects such as the one provided by the proponents in Table 11.4.

Response

Part 1: Clarify how the analysis considered potential zones of influence of noise, light and routine discharges when identifying the special areas that could be affected by routine operations. If there is potential for effects to extend to special areas not already discussed in IR-40, provide an analysis of effects of routine project operations on special areas that, while not directly overlapping the project area or vessel and aircraft transit routes, may be within the zone of influence for effects from noise, light, and drill cuttings disposal.

ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) recognize that the original response to this Information Requirement (IR) focused on special areas that overlapped with the Project Area, and did not take into consideration special areas outside the Project Area that have the potential to be affected by extended effects associated with noise, light, and drill cuttings.

To expand the effects assessment to include special areas outside of the Project Area that have the potential to be affected by extended effects associated with noise, light, and drill cuttings, a methodology must be applied that provides feasible and realistic boundaries, which is outlined below.

As outlined in Section 1.2.2 of the Environmental Impact Statement (EIS), specific well locations for the duration of the Project (i.e., 10 years for Equinor and 12 years for ExxonMobil) have not been selected.

Drill Cuttings

Zone of Influence

Based on drill cuttings modelling completed in Appendix G of the EIS, it was determined that 40 kilometres (km) at any of the modelled sites is the maximum distance that synthetic-based mud (SBM) drill cuttings may accumulate. Therefore, 40 km was selected as a very conservation zone of influence (ZOI) associated with drill cuttings. The model predicted that while SBM drill cuttings may accumulate, maximum thickness would only reach 0.06 millimetres (mm) in the model area and would not exceed the conservative predicted no effects threshold (PNET) of 1.5 mm.

As outlined in Figure 1 in the response to Information Request (IR) IR-39-2, a 40 km buffer was applied to the outer boundaries of the exploration licenses (ELs). In lieu of applying the 40 km buffer to individual ELs, which would result in seven separate ZOIs, three ZOIs were selected and grouped together adjacent to the ELs. This approach is very conservative, as the maximum boundary extents were selected.

The Equinor ELs overlap with the following eight special areas, which were discussed in Section 6.4 of the EIS, the original response to IR-39, and/or included in the follow-up response to IR-39-2:

- United Nations Convention on Biological Diversity (UNCBD) Ecologically and Biologically Significant Area (EBSA) – Seabird Foraging Zone in the Southern Labrador Sea;
- UNCBD EBSA – Slopes of the Flemish Cap and Grand Bank;
- Vulnerable Marine Ecosystem (VME) – Sackville Spur;
- VME – Northern Flemish Cap;
- Northwest Atlantic Fisheries Organization (NAFO) Fisheries Closure Area (FCA) – Sackville Spur (6);
- NAFO FCA – Northern Flemish Cap (9);
- NAFO FCA – Northwest Flemish Cap (10); and
- NAFO FCA – Northwest Flemish Cap (12).

Taking into consideration the 40 km buffer determined to be the ZOI for drill cuttings, exploration drilling activities associated with the Equinor ELs have the potential to extend to additional special areas including the following:

- UNCDB EBSA – Orphan Knoll;
- NAFO FCA – Northern Flemish Cap (7); and
- NAFO FCA – Northern Flemish Cap (8),

The ExxonMobil ELs overlap with the following four special areas, which are discussed in Section 6.4 of the EIS (as well as the EL 1134 Addendum), the original response IR-39 (except for EL 1134), and included in the follow-up response to IR-39-2:

- Snow Crab Stewardship Exclusion Zone – Crab Fishing Area – 8BX;
- UNCBD EBSA – Slopes of the Flemish Cap and Grand Bank;

- VME – Southern Flemish Pass to Eastern Canyons;
- NAFO FCA – Flemish Pass/Eastern Canyon (2);

Taking into consideration the 40 km buffer determined to be the ZOI for drill cuttings, exploration drilling activities associated with the ExxonMobil ELs have the potential to extend to additional special areas including the following:

- EBSA – Northeast Slope;
- VME – Northeast Shelf and Slope (within Canadian EEZ);
- VME – Beothuk Knoll;
- NAFO FCA – Northwest Flemish Cap (10); and
- NAFO FCA – Northwest Flemish Cap (11).

The eight additional special areas that are within the ZOI for drill cuttings for the Operators' Project ELs were discussed in Section 6.4 of the EIS, as they fall within the Regional Study Area (RSA), which is shown in Figure 4-1 of the EIS. However, they were not included in the original response to IR-40. Defining features associated with these additional special areas are outlined below.

Additional Special Areas within the Zone of Influence

EBSA – Northeast Slope

The EBSA is identified for high aggregations of Greenland halibut and spotted wolffish, which congregate in spring, as well as concentrations of cetaceans, pinnipeds and corals.

NAFO FCAs – Northern Flemish Cap (7), Northern Flemish Cap (8), Northwest Flemish Cap (10), Northwest Flemish Cap (11)

These four areas are portions of a group of six FCAs identified as NAFO Coral Closures, which were closed to protect high coral and sponge concentrations from bottom-contact fishing activities. The area is also described as containing sea pens, which are key biophysical components of soft-bottom VME indicator elements in the NAFO regulatory area. A system of sea pens extends around the edge of the Flemish Cap. Crinoids, cerianthids, and black corals are associated with the sea pen system and sponges, sea pens, cerianthids, and crinoids are also found outside the FCAs.

UNCBD EBSA – Orphan Knoll

The Orphan Knoll is a seamount, which typically support endemic populations and unique faunal assemblages. This seamount is an island of hard substratum with uniquely complex habitats that rise from the seafloor of the surrounding deep, soft sediments of the Orphan Basin. Although close to the adjacent continental slopes, Orphan Knoll is much deeper and appears to have distinctive fauna. Fragile and long-lived corals and sponges have been observed and a Taylor Cone circulation provides a mechanism for retention of larvae.

VME – Northeast Shelf and Slope (within Canadian EEZ)

This VME has been identified due to an abundance of gorgonian and black corals.

VME – Beothuk Knoll

The Beothuk Knoll was identified for abundant gorgonian corals and high density of sponges. Vulnerable fish species include: northern wolffish, spiny tailed skate, roundnose grenadier, deep-sea cat shark and black dogfish.

Effects Assessment

As indicated above, the additional special areas within the ZOI for drilling cuttings were primarily identified for the presence of sensitive benthic habitats. Some of these special areas have also been identified for the presence of various fish species and mammals (i.e., cetaceans and pinnipeds). The potential effects of drill cuttings deposition include: seabed disturbance (burial and smothering), chemical toxicity, and bioaccumulation (uptake of contaminants by fish and the presence or perception of taint). Benthic habitats are vulnerable to effects from deposition and accumulation on the ocean floor and these effects are discussed in the following paragraphs. Other marine species such as fish and mammals may be vulnerable to the effects of contamination.

To mitigate any contamination of marine species, once drilling commences, WBM cuttings will be discharged and SBM cuttings will be returned to the drilling installation for recovery and reuse or treatment and discharge in accordance with the *Offshore Waste Treatment Guidelines* (OWTG) (NEB et al 2010) and the International Convention for the Prevention of Pollution from Ships (MARPOL) (IMO 1973). In addition, chemicals used in drilling muds will be selected in accordance with the *Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands* (NEB et al 2009).

The discharge of drill cuttings is one of the primary potential interactions with benthic habitats during offshore drilling programs and effects are outlined in Section 8.3.4 of the EIS. Cuttings dispersion modelling was conducted as part of the EIS for this Project, which incorporated PNETs of 6.5 mm and 1.5 mm. In this modelling, the effects of exploratory drilling on invertebrate density and diversity were confined to the extent of the cuttings piles. As discussed in Section 2.5.2.1 of the EIS, pre-drill coral and sponge surveys will be completed prior to drilling, and mitigation measures will be implemented if required by the risk assessment.

Due to the presence of high currents in the Flemish Pass, cuttings piles are more likely to disperse in a shorter timeframe. Bottom currents will likely further aid in cuttings dispersion in this area, reducing potential for long term effects due to burial by sediments (Section 5.5 of the EIS). As discussed, the relevant special areas are also at depths of 500 m to 1,800 m, which may be distant from the location of deposition. As the special areas are generally characterized by deep-sea cold-water organisms that are generally slow growing and long-lived, recovery after disturbance may take a decade or more.

In summary, the predicted environmental effects of drilling discharges on special areas identified for sensitive benthic habitats are primarily related to potential sedimentation and burial of benthic species. As discussed in Section 2.5.2.1 of the EIS, pre-drill coral and sponge surveys and risk assessments will be completed and mitigation measures, if required from the risk assessment, will be implemented prior to drilling (e.g., relocating wellsite, using a cuttings transport system). These effects are predicted to be adverse, low in magnitude, localized and within the Project Area, short to long term in duration, occurring sporadically to regularly and reversible, with these predications being

made with a moderate to high level of confidence. With the implementation of appropriate mitigation measures, the overall magnitude of the effect of marine discharges on these special areas is anticipated to be low.

Light

Zone of Influence

As outlined in Section 9.3.3 of the EIS and the response to IR-86, Poot et al (2008) found that birds could be attracted to fully lit (30 kilowatts [kW]) oil platforms from up to 5 km; however, attraction from distances greater than 5 km could not be ruled out in this study. As outlined in the response to IR-82-2, information provided by Environment and Climate Change Canada (ECCC) was reviewed and taken into consideration. A recent global positioning system (GPS) tracking study found that birds from colonies up to 16 km were susceptible to stranding due to light attraction, which suggests that attraction distances of anthropogenic light sources may be greater than 5 km (Rodriguez et al 2014, 2015). It is noted that Project activities will emit less light than a fully lit production platform, and therefore the spatial extent of lighting attraction is predicted to be smaller. However, for the purposes of this IR, 16 km has been selected as a very conservative ZOI associated with lighting.

Similar to the drill cuttings outlined above, a 16 km buffer was applied to the outer boundaries of ELs and traffic routes, and the maximum extents were selected, which results in some areas extending further than 16 km; refer to Figure 1 in the response to IR-39-2. To further streamline the assessment, the 16 km was applied to the Equinor ELs (i.e., EL 1139, 1140, 1141, and 1142) and the ExxonMobil ELs (i.e., EL 1134, 1135, and 1137) as outlined in Figure 1 in the response to IR-39-2.

The drill cuttings section above outlines the eight special areas that overlap with the Equinor ELs, which are also discussed in the Section 6.4 of the EIS, the original response to IR-39, and follow-up response to IR-39-2.

Taking into consideration the 16 km conservative buffer determined to be the ZOI for lighting, exploration drilling activities associated with the Equinor ELs have the potential to extend to the additional special areas:

- NAFO FCA – Northern Flemish Cap (7); and
- NAFO FCA – Northern Flemish Cap (8),

Taking into consideration the 16 km conservative buffer determined to be the ZOI for lighting, exploration drilling activities associated with the ExxonMobil ELs have the potential to extend to the additional special areas:

- EBSA – Northeast Slope;
- VME – Northeast Shelf and Slope (within Canadian EEZ);
- NAFO FCA – Northwest Flemish Cap (10); and
- NAFO FCA – Northwest Flemish Cap (11).

The six additional special areas associated with the Operators' Project ELs were discussed in Section 6.4 of the EIS as they fall within the RSA, which is shown in Figure 4-1 of the EIS. However, they were not included in the original response to IR-40. Defining features associated with these additional special areas are outlined below.

Additional Special Areas within the Zone of Influence

The six additional special areas associated with the lighting ZOI are outlined in detail in the drill cuttings section above.

Effects Assessment

As outlined above, six additional special areas (i.e., NAFO FCAs) are within the 16 km conservative buffer determined to be the ZOI associated with lighting.

Four of the additional special areas are closed to protect high coral and sponge concentrations (i.e., NAFO FCAs) and one is associated with the abundance of gorgonian and black corals (i.e., VME). However, the Northeast Slope EBSA is associated with concentrations of corals and marine mammals (i.e., cetaceans and pinnipeds), as well as high aggregations of Greenland halibut and spotted wolffish in the spring. As outlined in the original response to this IR, benthic species are not anticipated to be adversely affected by light due to distance to the seafloor.

As described in Section 8.3 of the EIS, the presence and operation of the drilling installation will result in associated lighting that may affect marine fish through disturbance or changes to feeding activity. Light has potential to attract certain types of plankton that may in turn attract fish and other predators. Consequently, larger predators may also congregate around platforms due to opportunities to forage fish in well-lit surrounding waters. Artificial lighting is identified as a concern for marine mammals and sea turtles; however, as outlined above, these additional special areas are not associated with marine fish, marine mammals or sea turtles.

In summary, special areas that are identified due to the presence of sensitive benthic habitats are not anticipated to be adversely affected by light due to distance to the seafloor. Marine fish and mammals may be affected by artificial lighting through disturbance or changes to feeding activity and opportunistic predation. Such effects on marine fish and mammals are predicted to be adverse, low in magnitude, localized within the Project Area, short to medium term duration, occurring regularly and reversible, with these predictions being made with a moderate to high level of confidence.

Noise

Zone of Influence

As outlined in Section 10.3.3 of the EIS, results from modelling completed by another operator for the Scotian Basin indicated that predicted cumulative sound exposure levels (SELs) (over 24 hours) associated with operating drilling installations would decrease to below threshold values for potential marine mammal auditory injury at distances between 120 and 470 metres (m) from the source (Zykov 2016).

Similar to the drill cuttings and lighting buffers outlined above, a 470 m buffer was applied to the outer boundaries of ELs, and the maximum extents were selected, which results in some buffered areas extending further than 470 m beyond the EL boundaries (refer to Figure 1 in the response to IR-39-2). To further streamline the assessment, the 470 m buffer was applied to the Equinor ELs (i.e., EL 1139, 1140, 1141, and 1142) and the ExxonMobil ELs (i.e., EL 1134, 1135, and 1137) as outlined in Figure 1 in the response to IR-39-2.

The drill cuttings section above describes the eight special areas that overlap with the Equinor ELs, which are also discussed in the original response to IR-39 and follow-up response to IR-39-2. None of those special areas are associated with marine mammals or sea turtles, which are of concern from the perspective of effects of noise.

Taking into consideration the 470 m conservative buffer determined to be the ZOI associated with noise for all Project ELs, it was determined that this ZOI does not result in overlap with any additional special areas.

Additional Special Areas within the Zone of Influence

As mentioned above, taking into consideration the conservative ZOI associated with noise (i.e., 470 m), there are no additional special areas to discuss.

Effects Assessment

As mentioned above, taking into consideration the conservative ZOI associated with noise (i.e., 470 m), there are no additional special areas to discuss, and therefore effects assessment is not applicable. Refer to the original response to IR-40 for effects assessment associated with noise.

Traffic Routes

Zone of Influence

The ZOI for proposed traffic routes for marine vessels and helicopters is a combined buffer including the distances identified for both lighting and noise and is thus the same conservative 16 km buffer as used for lighting at the Project Area ELs. Thus, a buffer or 16 km has been applied to the vessel traffic routes (refer to Figure 2 in the response to IR-39-2). To further streamline the assessment, the 16 m buffer was applied to vessel routes for Equinor ELs (i.e., EL 1139, 1140, 1141, and 1142) and ExxonMobil ELs (i.e., EL 1134, 1135, and 1137) as shown in Figure 2 in the response to IR-39-2.

The Equinor EL traffic routes overlap with the following nine special areas, which were discussed in Section 6.4 of the EIS, the original response to IR-39, and/or included in the follow-up response to IR-39-2:

- EBSA – Northeast Slope;
- EBSA – Eastern Avalon;
- Marine Refuge – Northeast Newfoundland Slope Closure;
- Snow Crab Stewardship Exclusion Zone – Crab Fishing Area – 6C
- Snow Crab Stewardship Exclusion Zone – Crab Fishing Area – Nearshore
- UNCBD EBSA – Slopes of the Flemish Cap and Grand Bank
- VME – Northeast Shelf and Slope (within Canadian EEZ);
- VME – Sackville Spur;
- NAFO FCA – Sackville Spur (6);

- National Historic Site (NHS) – Signal Hill; and
- NHS – Cape Spear Lighthouse.

Taking into consideration the 16 km conservative buffer determined to be the ZOI, marine vessel and aircraft traffic noise associated with the Equinor ELs has the potential to extend to the following special areas:

- EBSA – Baccalieu Island;
- Snow Crab Stewardship Exclusion Zone – Crab Fishing Area – 6B Outer;
- VME – Northern Flemish Cap; and
- Important Bird Area (IBA) – Quidi Vidi Lake.

The ExxonMobil EL traffic routes overlap with the following seven special areas, which are discussed in Section 6.4 of the EIS, the original response to IR-39, and/or also included in the follow-up response to IR-39-2:

- EBSA – Eastern Avalon;
- National Historic Site – Signal Hill;
- Snow Crab Stewardship Exclusion Zone – Crab Fishing Area – 6C;
- Snow Crab Stewardship Exclusion Zone – Crab Fishing Area – Nearshore;
- UNCBD EBSA – Slopes of the Flemish Cap and Grand Bank;
- VME – Southern Flemish Pass to Eastern Canyons; and
- NAFO FCA – Flemish Pass / Eastern Canyon (2).

Taking into consideration the 16 km conservative buffer determined to be the ZOI, marine vessel and aircraft traffic noise associated with the ExxonMobil ELs has the potential to extend to the following special areas:

- EBSA – Baccalieu Island; and
- IBA – Quidi Vidi Lake.

The six additional special areas associated with the traffic routes for the Operators' Project ELs were discussed in Section 6.4 of the EIS as they fall within the RSA, which is shown in Figure 4-1 of the EIS. However, not all were discussed in the original response to IR-40. Defining features associated with these additional special areas are outlined below.

EBSA – Baccalieu Island

To date no information has been provided for the Baccalieu Island EBSA. However, as stated in Section 6.4.3 of the EIS, a portion of this area is also a Provincial Ecological Reserve. The Ecological Reserve was established to protect breeding seabird habitat. It has more breeding seabirds than any other area of the province, the largest Leach's storm-petrel colony in the world, and the second largest Atlantic puffin colony in North America. Baccalieu Island is also identified as an IBA.

VME – Northern Flemish Cap

The Northern Flemish Cap VME was identified for a high density of sea pens, soft corals, and black corals and, to a lesser extent, solitary stony corals and small gorgonians. Vulnerable fish species include northern wolffish and spiny dogfish.

IBA – Quidi Vidi Lake

Quidi Vidi Lake is within St. John's city limits and fed by the Virginia River and Rennies River. From late fall to early spring, Quidi Vidi Lake has substantial numbers of herring, great black-backed, Iceland, glaucous, and common black-headed gulls. Locally rare ring-billed gull, mew gull, and lesser black-backed gull have occasionally been reported. Waterfowl including American black duck, mallard, and northern pintail are common in winter.

NHS – Signal Hill

Historic site of wireless communication and military defence of St. John's Harbour.

NHS – Cape Spear Lighthouse

Restored historical lighthouse and lighthouse keeper's home on most eastern point of North America.

Effects Assessment

These additional special areas are associated with the presence of coastal birds and waterfowl, vulnerable fish species, sensitive bottom habitat, a crab closure area, and historic sites. The effects of light on fish species and bottom habitat are discussed above. Marine species such as mammals and fish may be sensitive to light and noise from vessel and aircraft traffic and are potentially vulnerable to injury from collisions with marine vessels. As discussed in the EIS, these species are highly mobile and thus can, for the most part, avoid marine traffic. Both Signal Hill and Cape Spear are popular destinations for tourists and local people. The Snow Crab Stewardship area is closed to crab fishing.

Overall, interactions between Project-related supply and servicing activities and fish, marine mammals, and users of coastal sites are anticipated to be minor due to the localized, short-term, and mobile (transitory) nature of these activities, and because they are generally in keeping with the overall marine traffic that has occurred throughout the region for many years. Vessel traffic for supply and servicing of the drilling installation represents a negligible contribution to the overall vessel traffic off Eastern Newfoundland, and Project-related supply vessel traffic will use existing and established routes wherever possible. Noise and artificial light from marine vessels and aircraft would be the primary potential concern for interactions with marine birds and bird habitats from supply and servicing activities.

As discussed, the Baccalieu Island EBSA has been identified (and a portion of this area has been protected as a Provincial Ecological Reserve) as sensitive bird habitat. Quidi Vidi Lake is an IBA. Section 9.3.8 of the EIS assesses the effects of supply and servicing on marine and migratory birds. The potential effects on are summarized here and additional information is provided in Section 9.3 of the EIS.

Marine traffic may affect seabirds through lighting, noise, and other associated environmental emissions and discharges. The various bird species that occupy the Project Area will not likely be disturbed by Project-related vessel activity or associated aircraft use, due to its short term and transitory nature and thus, its short-term presence at any one location. In addition, it is generally in keeping with the overall marine traffic that has occurred throughout the region for years.

The potential effects of bird attraction to nocturnal artificial lighting sources in the offshore are discussed in Section 9.3.3 of the EIS. For the most part, Project vessels are not stationary, except for occurrences when vessels are on-standby. Lighting disturbances will be highly transient but extend along the length of the identified vessel traffic routes. Mitigation measures outlined in Section 9.3.2 of the EIS will be used during Project operations to reduce the effects of bird attraction to lighting from Project vessels. However, overall the presence of these vessels in the offshore area would be a negligible addition of night lighting in this region.

The potential effects of Project-related discharges from vessels are described in Section 9.3.4 of the EIS. Supply vessel traffic to and from the drilling installation(s) will again be mobile, therefore, environmental disturbances and effects will be highly transient in nature. The release of organic wastes by offshore vessels and activities can attract birds, which may increase the potential for interactions including risk of predation, collision, and exposure to contaminants. However, this will be reduced with proper waste management practices and adherence to associated MARPOL requirements. The potential effects of waste discharges on marine-associated birds will be managed in keeping with regulatory requirements.

The primary interaction associated with helicopter use with marine and migratory birds is the possible disturbance effects of aircraft overflights. These effects include a potential temporary loss of useable habitat and increased energy expenditure due to escape reactions, increased heart rate, and lower food intake due to interruptions. Helicopter noise can disturb nesting seabirds at colonies, although seabird reactions to helicopters and other aircraft depend on several factors including species, previous exposure levels, and the location, altitude, and number of flights. The most obvious behavioural effect of helicopter noise on birds is that breeding birds may be flushed from the nest in response to loud noises, which can have immediate negative consequences including predation of eggs and chicks and decreased incubation and brooding. Nestlings may also be vulnerable to exposure, and adults may inadvertently knock eggs and flightless young from the nest, which is of concern for cliff-nesting species. Other behavioural effects may include reduced foraging and provisioning due to noise. Noise may also deter birds from favourable habitats and may alter migration paths, resulting in greater energy expenditure. Research has shown that overt behavioural responses, such as flushing, in response to aircraft traffic may occur at 366 m for common murres, although there is inherent variability in behavioural responses between, and within, species.

Overall, interactions between Project-related supply and servicing activities and bird species are anticipated to be minor due to the localized, short-term, and mobile (transitory) nature of these activities, and because they are generally in keeping with the overall marine traffic that has occurred throughout the region for many years. Vessel traffic for supply and servicing of the drilling installation represents a negligible contribution to the overall vessel traffic off Eastern Newfoundland, and Project-related supply vessel traffic will use existing and established routes wherever possible. Helicopters will be used for crew transfers and other purposes as required, but these are anticipated to be infrequent. Helicopters will avoid coastal seabird colonies during the nesting season as per the *Seabird Ecological Reserve Regulations, 2015*.

Adverse interactions with and effects on coastal breeding colonies and other bird habitat are unlikely. In accordance with standard practices, vessels will transit in a straight-line approach from port, unless the presence of pack ice or other environmental phenomena requires routes to be altered, and the helicopter routes that will be used have been commonly used by the offshore oil and gas industry over the past 20 years. Therefore, the amount of time these vessels are near coastal habitats will be

brief. The amount of helicopter traffic will be reduced to the lowest level practical for the Project, and low-level aircraft operations will be avoided, as appropriate. Known and observed bird colonies, large aggregations of avifauna, critical habitats, and protected or sensitive areas and times will also be avoided wherever possible. This includes avoidance of helicopter use near seabird breeding colonies during the period from May 1st to August 31st (with an end-date of September 30th for northern gannet colonies).

In summary, the predicted environmental effects of supply and servicing activities are primarily related to potential disturbance due to vessel movements, release of organic wastes leading to increased food availability, and attraction / disorientation of birds due to lighting. These may result in changes in mortality/injury levels, and the presence and abundance of avifauna. These changes are predicted to be adverse but low in magnitude, localized in extent, short-term, regular in frequency, and reversible, with these predictions being made with a high level of certainty.

Part 2: Further to the updated map and table required in IR-39-2, ensure that the analysis of effects of supply and servicing identifies the special areas that could interact (if any) with the Projects along or nearby potential vessel and aircraft transit routes and include this information in a consolidated list of special areas that could overlap with the Projects such as the one provided by the proponents in Table 11.4.

The following table provides a summary of the special areas that overlap with the vessel traffic routes and ZOI related to the proposed traffic routes between the various ELs and the Port of St. John's.

Table 1 Special Areas Overlapping with Project Vessel Traffic Routes and ZOI

Vessel Traffic Routes	Overlapping Special Areas
Equinor ELs 1139, 1140, 1141, and 1142	EBSA – Eastern Avalon EBSA – Northeast Slope Marine Refuge - Northeast Newfoundland Slope Closure Snow Crab Stewardship Exclusion Zone – 6C Snow Crab Stewardship Exclusion Zone – Near Shore UNCBD EBSA - Slopes of the Flemish Cap and Grand Bank VME – Sackville Spur VME – Northeast Shelf and Slope (within Canadian EEZ)
ExxonMobil ELs 1134, 1135, and 1137	EBSA - Eastern Avalon Snow Crab Stewardship Exclusion Zone – 6C Snow Crab Stewardship Exclusion Zone – Near Shore UNCBD EBSA - Slopes of the Flemish Cap and Grand Bank NAFO FCA - Flemish Pass / Eastern Canyon (2)

References

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INFORMATION REQUIREMENT – IR-41-2

The Agency required additional information on potential interactions between commercial fisheries operating within transit routes and vessel traffic. In its response, the proponent indicated that the mitigation measures discussed in the effects assessment, including those regarding the implementation of a compensation program for gear damage, are equally applicable to commercial fisheries occurring along potential vessel transit routes as they are for those occurring within the Project Area.

Sipekne'katik First Nation expressed interest in how compensation programs for offshore exploration drilling projects would take into account the differences between the communal commercial rights holders fishery and the commercial fishery stakeholders fishery:

- stakeholders have the ability to leverage their fishing licence as an asset, whereas rights holder's licences do not allow for this,
- stakeholders have the ability to apply for employment insurance, whereas rightsholders' licences do not allow for this, and
- the income from the communal commercial rights holders is an important source of revenue to the community.

Sipekne'Katik First Nation noted that these differences should be recognized in the development and the implementation of any fishing gear damage or loss compensation programs.

The KMKNO has expressed interest in how offshore exploration projects would involve Indigenous groups in the development of fishing gear damage or loss compensation programs.

Specific Follow-up Question/ Information Requirement

With respect to the development and implementation of the fishing gear damage or loss compensation program, discuss how differences between the communal commercial rights holders' fishery and the commercial fishery stakeholder's fishery would be considered.

Provide information on if and how Indigenous groups would be involved in the development of the fishing gear damage or loss compensation program.

Response

As indicated in Section 13.3.2 of the Environmental Impact Statement (EIS), the compensation program will outline procedures for actual loss or damages to commercial and communal-commercial fishers, and actual loss or damage include aspects such as loss of income or future income, loss of hunting, fishing or gathering opportunities, caused by the Project, therefore both commercial and communal-commercial fisheries will be incorporated into the compensation program. ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) will invite the Indigenous groups holding communal-commercial licenses that overlap with the Project Area to participate in the development of the compensation program prior to commencing the first exploration drilling program. In developing the compensation program, the Operators will also consider the requirements outlined in the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity* (C-NLOPB 2017a). These guidelines were recently revised, and subject to a review between April 19, 2017 and June 2, 2017 (C-NLOPB 2017b).

References

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2017a. Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity. Available online: https://www.cnlopb.ca/wp-content/uploads/guidelines/compgle.pdf. Accessed September 2018.

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INFORMATION REQUIREMENT – IR-47-2

The Agency required a reference for the statement in Section 15.2.2 of the EIS that previous analysis indicated a nearshore spill event would result in oil moving to the east and not contacting the shoreline. The Agency further required an assessment of effects of a nearshore vessel spill on relevant valued components.

The proponents provided new modelling results for the Nexen Energy ULC Flemish Pass Exploration Drilling Project, in which modelling of a spill from a supply vessel showed oil migrating to the east, without shoreline oiling. The original reference supporting the statement in the Section 15.2.2 of the EIS was not provided. It is noted that the Nexen model was for a vessel spill originating at the midpoint between St. John's and the Nexen project area (in the Flemish Pass), and therefore still a considerable distance offshore.

The proponents stated that vessel collisions in the nearshore are highly unlikely, and that nearshore effects of oiling were examined in the context of an offshore blowout. It is noted, however, that oil from an offshore blowout would be highly weathered in the unlikely event of shoreline contact; should a spill occur in the nearshore, time to shore and potential weathering might be considerably different. The EIS Guidelines (Section 6.6.1) require consideration of accidents in the near-shore environment (e.g. spills and ship groundings, as applicable).

Specific Follow-Up Question/Information Requirement

As per the original IR, provide a reference and further information on the nearshore spill modelling referred to in Section 15.2.2 of the EIS. Provide a discussion on the effect of a spill on coastal species and habitats, if a vessel collision was to occur close to shore. Indicate the prevention measures that would be taken to minimize the risk of vessel collisions, as well as mitigation and follow-up in the event of a spill from a vessel collision in the nearshore.

Response

Part 1: As per the original IR, provide a reference and further information on the nearshore spill modelling referred to in Section 15.2.2 of the EIS.

Section 15.2.2 of the Environmental Impact Statement (EIS) contained the reference associated with a report that indicated a nearshore spill event would result in oil moving east and would not contact the shoreline (i.e., RMRI nd). Section 15.6 of the EIS, which is the reference section for the Accidental Events chapter, includes this reference as well. ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) acknowledge that the reference in the EIS indicates an unknown date and an inaccurate title; the reference section below includes the updated and accurate reference.

The Risk Management Research Institute (RMRI) prepared the *Quantitative Assessment of Oil Spill Risk for the South Coast of Newfoundland and Labrador (Phase 1)* for Transport Canada in March 2006 (RMRI 2006) (herein referred to as the RMRI Report). The RMRI Report is not available online; however, a hard copy was obtained from Transport Canada when preparing the EIS.

The area of interest (AOI) is shown in Figure 2.1 of the RMRI Report and is "*from Cape St. Francis to a point 50 nautical miles east following the coast to 50 nautical miles off Cape Race and continuing*

along to 50 nautical miles south of Cape Ray"; this includes the eastern Avalon Peninsula, including St. John's, Newfoundland and Labrador (NL) (RMRI 2006). The RMRI Report also designated five zones within the AOI, including Zone 5, which included the St. John's port and its approaches (RMRI 2006). As outlined in Section 4.1.5 of the RMRI Report, vessel traffic taken into consideration for Zone 5 included "*tankers, ocean liners, commercial transport vessels, tugs, fishing vessels, ferries, offshore petroleum supply vessels, seismic vessels, occasional specialized vessels for the offshore petroleum industry, research and security vessels, and vessels destined for the St. John's ship yard" (RMRI 2006).*

The RMRI Report derived spill frequencies by taking into consideration aspects such as, but not limited to, tanker oil spills and fuel spills from vessels. Spill frequencies for Zone 5 are outlined in the RMRI Report in Tables 4.25a and 4.25b (RMRI 2006).

Section 5.0 of the RMRI Report outlines representative spill locations for each Zone, with Zone 5 being located approximately 8 kilometres (km) east of St. John's, NL and shown in Figure 5.12 of the RMRI report (RMRI 2006). The RMRI Report provided by Transport Canada does not include details on the size of the spill or scenario associated with Zone 5, however, Section 5.5. states "*Based on a similar methodology to that used for Hazard Zone 3 in Section 5.3, oil from the spill would move to the east and not contact shoreline. This conclusion is based on the assume prevailing wind and sea conditions.".*

The Operators acknowledge that the vessel collision model discussed in the original response to this Information Requirement (IR) (i.e., release of 750,000 L from a vessel collision that occurred between St. John's, NL and the Nexen Energy ULC project area in the Flemish Pass) (Nexen Energy ULC 2018) is located a considerable distance from the nearshore; however, the modelled results predicted that oil would migrate to the east and would not cause shoreline oiling, which aligns with the results from the RMRI Report that involved a spill scenario 8 km east of St. John's, NL, as outlined above.

Part 2: Provide a discussion on the effect of a spill on coastal species and habitats, if a vessel collision was to occur close to shore.

Based on the spill trajectory models that have been completed for vessel collisions nearshore (RMRI 2006 and Nexen 2018), oil is predicted to migrate to the east, and is not anticipated to contact the shorelines of coastal communities in Newfoundland and Labrador, Nova Scotia, New Brunswick, Prince Edward Island or Quebec. Therefore, an effects assessment on coastal species and habitats is not required.

Part 3: Indicate the prevention measures that would be taken to minimize the risk of vessel collisions, as well as mitigation and follow-up in the event of a spill from a vessel collision in the nearshore.

As indicated in Section 2.5.2.6.2 of the EIS, supply and support vessels will be contracted from third-party suppliers. Section 1.2.2 of the EIS also indicates that supply and support vessels will take a direct route, depending on weather and ice conditions, to active drilling installations in the Project Area, which will include using existing and well-established routes off eastern Newfoundland that have been used for decades. As outlined in Section 2.5.2.6.2, there have been no vessel collisions in the nearshore associated with oil and gas activities.

The Operators are not responsible for collision prevention measures or spill response, mitigation and/or follow-up in the event of a supply or support vessel collision outside the drilling installation safety zone, including the nearshore. As outlined in Section 15.0 of the EIS, the vessel operator will be the Responsible Party in the event the source of the spill is a supply or support vessel, which aligns with requirements under the *Canada Shipping Act, 2001* (GOC 2017). Third-party vessels are required to meet applicable Canadian and international regulations (e.g. *Canada Shipping Act, 2001* [GOC 2017], *Collision Regulations* [GOC 2014], *Environmental Response Arrangements Regulations*, [GOC 2008]). The Operators acknowledge select requirements for vessel operators under the *Canada Shipping Act, 2001* (GOC 2017) including, but not limited to, having an arrangement with a response organization, oil pollution prevention plan, and oil pollution emergency plan. Under the *Canada Shipping Act, 2001* (GOC 2017), vessel operators are also required to have an on-board declaration that outlines information such as, but not limited to, identifying the vessel's insurer and confirming the response arrangement is in place. As outlined in Section 2.5.2.6.2 of the EIS, vessels will be contracted from third-party suppliers and will be required to have valid marine certification from Transport Canada and meet regulatory requirements as set out by Canada and international organizations, as well as meeting Operator marine vessel vetting requirements.

References

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RMRI (Risk Management Research Institute). 2006. Quantitative Assessment of Oil Spill Risk for the South Coast of Newfoundland and Labrador (Phase 1). Prepared for Transport Canada. RMRI Ref. CAN/0179/R001.

INFORMATION REQUIREMENT – IR-48-2

The Agency required additional rationale and analysis as to why monitoring of a worst-case synthetic drilling fluid spill was not undertaken. In their response, the proponents indicated that a model of a synthetic based fluid spill would provide a footprint of the likely area to be potentially affected, but the resulting environmental effects would not change from those discussed in the EIS. It is noted that Section 15.5.1.2 of the EIS provides a brief list of the potential effects of a SBM spill, and refers to information in Section 8 of the EIS on toxicity of SBM. An analysis specific to potential accidental release of a large volume of SBM is not provided.

Specific Follow-up Question/Information Requirement

Provide an expanded analysis of the potential effects of a SBM spill on relevant valued components, including sensitive benthic species. In the analysis, provide information on typical behaviour of spilled SBM in both deep and shallow water, the potential maximum area that could be affected by a large-scale spill, and the estimated recovery time for affected benthos.

Provide an overview of SBM spill prevention measures incorporated into the projects. Discuss mitigation measures and follow-up that would be undertaken in the event of a release of SBM.

Response

Part 1: Provide an expanded analysis of the potential effects of a SBM spill on relevant valued components, including sensitive benthic species. In the analysis, provide information on typical behaviour of spilled SBM in both deep and shallow water, the potential maximum area that could be affected by a large-scale spill, and the estimated recovery time for affected benthos.

Section 15.5.1.2.3 of the Environmental Impact Statement (EIS) provides information associated with the effects of a spill of synthetic-based muds (SBM); however, as requested above, an expanded effects analysis on relevant valued components (VCs) is outlined below and takes into consideration three case studies.

<u>May 2003 – Gulf of Mexico – SBM Spill in 1,841m Water Depth</u>

In May 2003, an offshore operator was completing drilling activities in approximately 1,841 metres (m) water depth (USDOI MMS 2004). Approximately 390 cubic metres (m^3) of SBM was released from two locations where the riser parted (USDOI MMS 2004). The SBM consisted of approximately 58% synthetic base oil, and therefore the actual amount of synthetic base oil released was approximately 226 m^3 (USDOI MMS 2004).

As outlined in USDOI MMS (2004), remotely operated vehicle (ROV) surveys observed fish, sea cucumbers, a probable sea pen, and possible anemones. The release of SBM would likely affect benthic species by smothering and/or creation of anoxic (i.e., without oxygen) environment; however, mobile marine species would likely be able to avoid burial (USDOI MMS 2004).

USDOI MMS (2004) did not indicate an affected area; however, it was determined that partial recovery of benthic community would occur within weeks or months of the release, and a generally full recovery within one to two years. It was concluded that the release would not result in a significant impact on the benthic communities (USDOI MMS 2004).

August 2004 – Offshore Nova Scotia – SBM Spill in 2,067 m Water Depth

In August 2004, an offshore operator was completing exploration drilling activities approximately 60 kilometres (km) south of Sable Island, which is located offshore Nova Scotia, and in approximately 2,067 m water depth (CNSOPB 2005). Approximately 354 m^3 of SBM was released from the riser flex joint at 17.6 m above the seafloor (CNSOPB 2005). The SBM consisted of approximately 57% synthetic base oil, and therefore the actual amount of synthetic base oil released was approximately 202 m^3 (CNSOPB 2005).

Based on the environmental assessment completed by the operator in 2002, several benthic species were present in the area including brittle stars, clams, snails, sponges, and corals; however, there was no evident of dense aggregations of corals (CNSOPB 2005). Pelagic and demersal fish species were also present in the area (CNSOPB 2005).

As outlined in Section 4.2.2 of CNSOPB (2005), an ROV collected observational data, which showed SBM settled on the seafloor and flowed down slope from the wellhead in narrow ribbons. The total area of SBM, assuming a 1 centimetre (cm) thickness, was estimated to be 35,000 square metres (m^2) and appeared to form a layer above the natural sediment (CNSOPB 2005).

In addition to the ROV observations, sediment samples were collected from four areas on the seafloor near the wellhead (CNSOPB 2005). It is noted in CNSOPB (2005) that samples were collected with the ROV, and the technique may lack scientific rigor; however, due to the depth (i.e., 2,067 m), there was limited available equipment options to collect the samples. Sediment samples were analysed for barium and total extractable hydrocarbons (TEHs). Background samples were collected as "Sample 3" and barium and TEH concentrations were reported as 360 to 540 milligrams per kilogram (mg/kg) and 1-3 mg/kg, respectively (CNSOPB 2005). Samples 1, 2, and 4 reported concentrations above background levels, and reported a barium range of 560 to 82,000 mg/kg and TEH range of 16 to 230,000 mg/kg (CNSOPB 2005).

Fish and mobile invertebrates are capable of avoiding SBM and were not expected to be negatively impacted (CNSOPB 2005). Benthic organisms and marine species that depend on retrieving food from sediment and species that have larvae settle within the sediment would likely be negatively affected by the SBM spill (CNSOPB 2005). As outlined in CNSOPB (2005), it was determined that the recovery of the benthic environmental and the effects of the SBM was expected to take approximately five years. Due to the low toxicity of SBM, CNSOPB (2005) determined that the environmental impact of the spill was expected to be minor and no remediation was recommended.

June 2018 – Offshore Nova Scotia – SBM Spill in 2,800 m Water Depth

In June 2018, an offshore operator was completing exploration drilling activities approximately 330 km offshore Nova Scotia, and in approximately 2,800 m water depth (CNSOPB 2018a). Approximately 136 m^3 of SBM was released from piping that forms part of the mud system (CNSOPB 2018a). The SBM consisted of approximately 50 to 65% synthetic base oil (CNSOPB 2018b), and therefore the actual amount of synthetic base oil released was approximately 68 m^3 to 82 m^3. Based on the information posted to date by CNSOPB, there has been no indication of the area that the SBM release covered, and it is unknown whether this information would be available in the environmental fate and effects analysis that the operator is required to complete (CNSOPB 2018c).

Prior to commencing drilling activities, the operator completed a pre-drilling ROV survey 500 m around the wellsite to determine the presence or absence of any aggregations of habitat-forming corals or sponges, or any other environmentally sensitive features (CNSOPB 2018d). It was concluded by a third-party Marine Scientist that no aggregations of habitat-forming corals and sponges, or any other environmentally sensitive features were identified on the seafloor in the survey area (CNSOPB 2018d).

As outlined in CNSOPB (2018c), the operator was required to complete and environmental fate and effects analysis; however, a copy of this report was not publicly available at the time of preparing the response to this IR. It is noted in CNSOPB (2018c) that SBM would settle to the seabed and therefore there is minimal potential for surface impacts to marine mammals or seabirds. CNSOPB (2018c) further describes that SBM has a low toxicity, and therefore it is not expected to have an impact on fish or other marine species in the water column. However, settled SBM may result in physical smothering of the seabed (CNSOPB 2018c), and could therefore impact benthic species, if present.

SBM Spills in Shallow Water

The three case studies outlined above are all applicable to deep-water environments. ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) could not find available literature associated with a release of SBM in shallow water; however, the effects are anticipated to be similar as those associated with deep-water locations (i.e., potential impact to benthic species by smothering, no anticipated impact to fish and other marine species in the water column due to their mobility, and no anticipated impact to marine and migratory birds, marine mammals and sea turtles due to SBM settling to the seafloor).

Part 2: Provide an overview of SBM spill prevention measures incorporated into the projects. Discuss mitigation measures and follow-up that would be undertaken in the event of a release of SBM.

SBM spill prevention measures that may be incorporated include, but are not limited to: completing inspections and/or testing of critical hoses, values, and equipment prior to loading SBM on the drilling installation; using a spotter during mud transfers; maintaining volume control of SBM in the well by monitoring volumes of mud to ensure there are no losses; and using transfer hoses that are typically equipped with valves that would re-seal in the event that a hose breaks. The specific inspections, testing, and valves are specific to the drilling installation being used.

In the unlikely event of a significant accidental SBM release, the Operators would work with the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) on appropriate actions to determine the immediate and root cause of the incident and to assess any potential environmental impacts. It is anticipated that the actions applicable to potential environmental impacts may be similar to those required for the Nova Scotia SBM spills outlined above (e.g., collection of video footage and sediment samples).

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CNSOPB. 2018a. Incident Bulletins. Available online: https://www.cnsopb.ns.ca/media/incident-bulletins. Accessed September 2018.

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CNSOPB. 2018c. Drilling Mud Questions & Answers. Available online: https://www.cnsopb.ns.ca/sites/default/files/pdfs/Drilling_Mud_Questions_and_Answers.pdf. Accessed September 2018.

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INFORMATION REQUIREMENT – IR-58-2

The Agency required the proponents to discuss the probability of a vessel spill or well blowout reaching the Gulf of St. Lawrence and the Gaspé Peninsula and describe the potential environmental effects. The proponents' provided information on the scenarios modelled for an unmitigated subsea blowout and batch spill and their respective potential to reach the shoreline.

After reviewing the proponents' response, inconsistencies were identified when comparing it to information provided in the Eastern Newfoundland Offshore Exploration Drilling Project EIS. Section 4.2.3 of Appendix E for the Flemish Pass Exploration Drilling Project EIS does state that shoreline oil exposure is predicted to be less than 1% of the annual scenarios, as indicated in the proponents' response. However, this is not correct for sites modelled for Eastern Newfoundland Offshore Exploration Drilling Project. Table 15.17 of the Eastern Newfoundland EIS and Table 4-2 of the Eastern Newfoundland Appendix E describes the average annual probability of shoreline contamination as ranging from 2 to 7% depending on spill model release site and scenario.

The proponents' response also states that oil exposure greater than 1 gram per meter squared is not anticipated to reach the Gulf of St. Lawrence, however figures 4-10, 4-11, 4-12, 4-29 and 4-30 of Eastern Newfoundland Appendix E and figures 15-7, 15-8 and 15-20 of the Eastern Newfoundland EIS appear to show probability of oil exceeding thresholds within the Gulf of St. Lawrence.

Specific Follow-up Question/Information Requirement:

Provide project-specific discussions of the probability that oil from a vessel spill or well blowout could reach the Gulf of St. Lawrence and describe the potential environmental effects, taking into consideration existing modelling results which appear to show oil within the Gulf of St. Lawrence.

Response

The reviewer noted above that inconsistencies were identified when comparing the results of Appendix E associated with the ExxonMobil Canada Ltd. (ExxonMobil) Eastern Newfoundland Offshore Exploration Drilling Project Environmental Impact Statement (EIS) and Appendix E associated with the Equinor Canada Ltd. (Equinor) Flemish Pass Exploration Drilling Project EIS. The spill models took into consideration several varying parameters such as location, water depth, release rate and total released volume, and therefore different modelling results are anticipated, including probabilities for shoreline contact.

The original response to this Information Requirement (IR) focused on Appendix E of Equinor's Flemish Pass Exploration Drilling Project EIS, which discussed less than 1% of the annual scenarios reaching the shoreline. However, ExxonMobil and Equinor (herein referred to as the Operators) recognize that shoreline oiling probability associated with the ExxonMobil Eastern Newfoundland Offshore Exploration Drilling Project should have been included, and as outlined in Appendix E, the probability of shoreline oiling is 2-10%.

Fisheries and Oceans Canada (DFO) defines the Gulf of St. Lawrence in the *Gulf of St. Lawrence Integrated Management Plan* (DFO 2013), which is also included as Figure 1 below. Based on the boundaries of the Gulf of St. Lawrence outlined in Figure 1, the Operators concluded that applicable figures in Appendix E (i.e., 4-10, 4-11, 4-12, and 4-30) and the EIS (i.e., 15-7 and 15-8) do not show oiling within the Gulf of St. Lawrence. However, the Operators recognize that Figure 4-29 in Appendix

E does result in a low (i.e. less than 1%) probability of shoreline oiling and is associated with a minimum time of 100 days (Figure 2). As mentioned in Section 4.1.3 of Appendix E, it is important to note that the stochastic figures do not imply that the entire contoured area would be covered with oil in the event of a single release, and oil that is predicted to make contact with shorelines is expected to be highly weathered. These spill scenarios are considered representative of credible worst-case with no mitigation measures.

If a subsea blowout were to occur, applicable mitigation measures would be implemented, thereby further reducing the potential for highly weathered oiling to occur in the Gulf of St. Lawrence.

Even in the unlikely event of a worst-case, unmitigated accidental event, there is low probability of shoreline oiling within the Gulf of St. Lawrence (i.e., less than 1%) and therefore an environmental effects assessment should not be required.



Figure 1 Gulf of St. Lawrence as defined by DFO (DFO 2013)

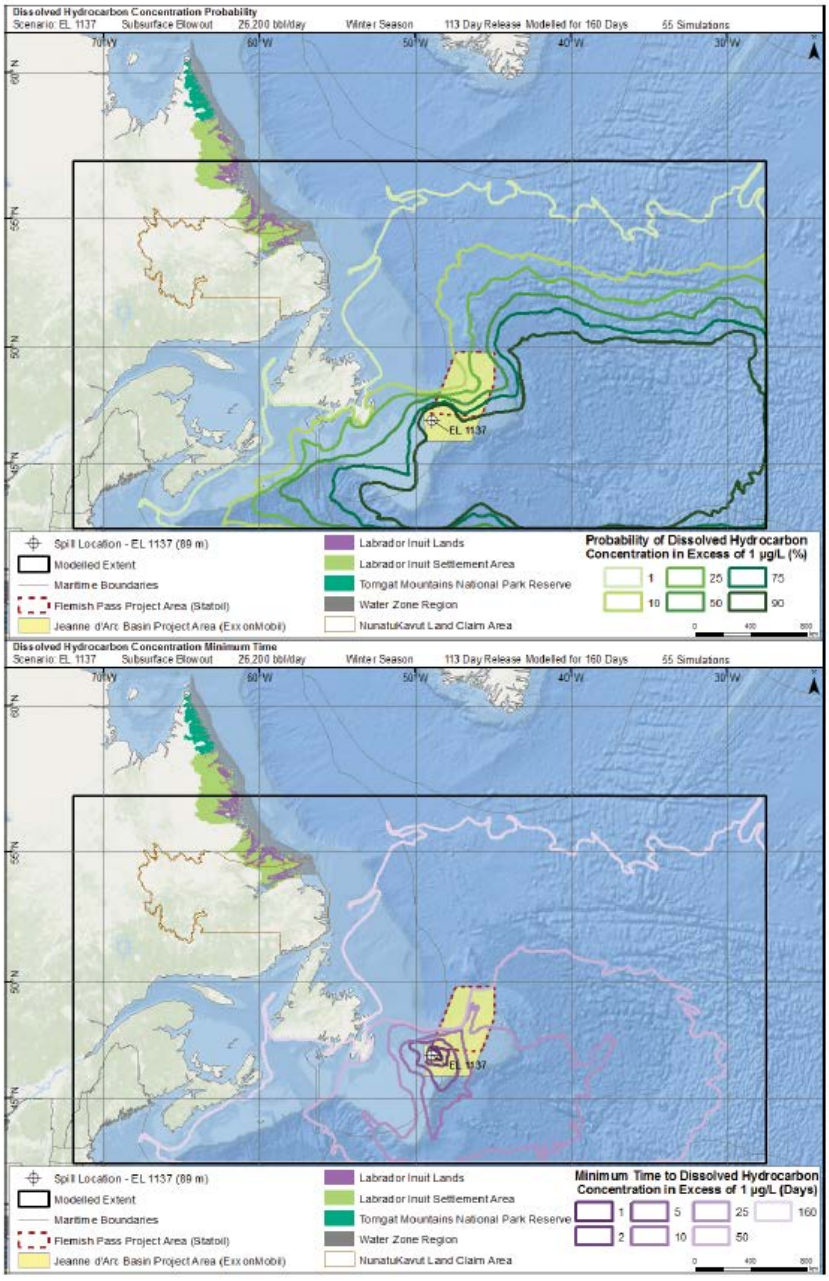


Figure 4-29: Winter probability of dissolved hydrocarbon concentrations > 1 µg/L at some depth in the water column (top) and minimum time to threshold exceedance (bottom) resulting from a 113-day subsurface blowout at the EL 1137 site.

Figure 2 Figure 4-29 of ExxonMobil's Appendix E

References

DFO (Fisheries and Oceans Canada). 2013. Gulf of St. Lawrence Integrated Management Plan. Available online: http://publications.gc.ca/collections/collection_2014/mpo-dfo/Fs149-7-2013-eng.pdf. Accessed September 2018.

INFORMATION REQUIREMENT – IR-78-2

The Agency required information on the types and amounts of biocides to be used, as well as the environmental effects of the biocides (both routine use and accidental spills) on relevant valued components. The proponents indicted that while biocides have not yet been determined, they would be selected as per the Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Lands. A biocide (MyacideTMGA25) screened for a previous Equinor drilling program was identified for information purposes. The response noted that biocides will be identified in the Environmental Protection Plans, which are submitted for C-NLOPB approval as part of the Operations Authorization process, prior to work commencing.

Specific Follow-Up Question/Information Requirement

While it was noted that biocides may not be used during exploration drilling, as was the case with the drilling conducted by Equinor during 2017, provide information on the potential impacts of biocides on the marine environment from similar or comparable installations. Provide information related to the function of biocides during offshore exploration drilling, the zone of influence when discharged, effects on target species versus incidental species, and as well as potential quantities that may be used.

Indicate the volume of biocide stored on the drilling installation during previous drilling programs, and evaluate the potential effects of an accidental spill of this stored volume on the surrounding environment and valued components.

Response

Part 1: While it was noted that biocides may not be used during exploration drilling, as was the case with the drilling conducted by Equinor during 2017, provide information on the potential impacts of biocides on the marine environment from similar or comparable installations.

Due to the temporary nature of exploration drilling, biocides are not typically required in cooling water systems, which is more applicable to offshore oil and gas production facilities. A common exploration drilling activity that may require the use of biocides is during well decommissioning; however, biocides would be added to seawater contained in the wellbore and therefore would not enter the marine environment. A less common application of biocides associated with exploration drilling is an additive to water-based drilling mud (WBM); however, this is typically only required if WBM is pre-mixed and stored. As mentioned in the original response to this Information Requirement (IR), biocides were not required for the Equinor Canada Ltd. (Equinor) 2017 exploration drilling programs, which reinforces that biocides are not commonly used for exploration drilling activities.

Literature associated with biocides in WBM could not be located, therefore the environmental impacts of biocides to the marine environment outlined below is focused on biocides used in cooling water systems and municipal wastewater treatment systems.

Bacterial and marine growth in cooling water systems can lead to the formation and accumulation of slimes and biofilms, which can cause corrosion over time and may also lead to obstructions in the system (UK Marine SAC nd). Lack of, or inadequate, marine growth control has the potential to cause safety issues, reduce efficiency, and increase cost. Biocides are used in various industrial

applications including those associated with, but not limited to, oil and gas, pulp and paper, municipal water and wastewater, shipping, aquaculture, and power generation.

Biocides are chemicals with an active, and in general, toxic effect on living organisms and may extend beyond the target organism and therefore have the potential to have an adverse effect on the environment (Cloete and Flemming 2013). There are two groups of biocides – oxidizing and non-oxidizing (UK Marine SAC nd).

Oxidizing biocides include chlorine and bromine-based compounds and are not selective to the organisms that are targeted (UK Marine SAC nd; Cloete and Flemming 2013). Chlorine, chlorine dioxide, and hypochlorous acid are the most widely used biocides worldwide (Cloete and Flemming 2013). Offshore oil and gas production facilities commonly use on-board sodium hypochlorite generation systems to control marine growth in cooling water systems for production facilities (Industrial WaterWorld nd).

Non-oxidizing biocides include a variety of organic chemical compounds and typically target one type of organism (UK Marine SAC nd). As outlined in the original response to this IR, MyacideTMGA25 was screened for Equinor's 2017 exploration drilling programs, and it was determined to be acceptable for use; however, as indicated in the original response to this IR, it was not used. MyacideTMGA25 is also known as glutaraldehyde and is an aldehyde-based biocide, which falls under the non-oxidizing group (Cloete and Flemming 2013).

While not directly linked to offshore oil and gas activities, the following discussion provides an overview of the use of biocides in municipal wastewater systems and their potential effects. The two major sources of chlorinated wastewater effluents in Canada include: 1) effluents from municipal wastewater treatment plants and from industrial plants treated with chlorine products for disinfection; and 2) cooling water from power plants and industrial plants treated with chlorine to prevent biofouling (GOC et al 1993). As outlined in GOC et al (1993), approximately 400 municipal wastewater treatment plants discharge an estimated 6,110,000 cubic metres per day [m^3/d] and 11 major power utilities discharge between 10,000 m^3/d to 7,800,000 m^3/d. As outlined in GOC et al (1993), in-situ testing and biological surveys were completed downstream of Canadian municipal wastewater treatment plants and demonstrated that chlorinated wastewater effluents caused acute lethality to fish and changes in community structure in benthic invertebrate communities up to 500 metres (m) from the outfall. Information associated with receiving water bodies was not outlined in GOC et al (1993) in detail; however, it is assumed that receiving waters were either freshwater or coastal areas. The Project Area is likely not comparable due to aspects such as, but not limited to, distance offshore, water depths, wave action, and temperature. As mentioned in GOC et al (1993), little information is available to compare the toxic effects of chlorinated wastewater effluents discharged to marine ecosystems. As previously mentioned, exploration drilling activities do not typically require biocides for cooling water, and biocides are limited to additives to WBM if pre-mixing and storage occurs.

Cooling water discharge rates associated with offshore oil and gas platforms are substantially lower than the major Canadian sources mentioned above. In 2005, Southern California had 23 offshore oil and gas production facilities, which reported an annual total volume of operational discharges of 60,000 cubic metres (m^3) (Lyon and Stein 2005). Cooling water comprised approximately 99% of the operational discharge volume in 2005, which equates to an annual total of approximately 59,400,000 m^3 for 23 offshore oil and gas platforms (Lyon and Stein 2005). The volumes provided in Lyon and Stein (2005) can be further broken down to provide volume estimates per day for all 23 platforms

(i.e., 162,720 m^3/d) and by platform (7,076 m^3/d per platform). It is noted that these cooling water discharge rates are estimates only, as details are not available for daily use by platform. As mentioned above, exploration drilling activities do not typically require biocides for cooling water, and biocides are limited to additives to WBM if pre-mixing and storage occurs.

As outlined in UK Marine SAC (nd), existing programs on risk assessment of chemicals can effectively be used to review biocides. As outlined in the Environmental Impact Statement (EIS) (e.g., Sections 2.9, 2.9.4, 2.10.1.7), products that have the potential to be discharged to the marine environment will be selected in accordance with the Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Lands (NEB et al 2009) (herein referred to as the Chemical Selection Guidelines). The Chemical Selection Guidelines provide a procedure and criteria for offshore chemical selection, and the objective is to promote the selection of lower toxicity chemicals to reduce the potential environmental effects of a discharge where technically feasible. If biocides are required, or potentially required, for drilling activities, they would be screened as per the Chemical Selection Guidelines, which is also re-iterated in Sections 2.11 of the Offshore Waste Treatment Guidelines (OWTG) (NEB et al 2010). Under the OWTG, offshore operators are permitted to discharge biocides to the marine environment provided the types and concentrations are outlined in their Environmental Protection Plans (EPPs), which are required to be approved by Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) as part of the Operations Authorization (OA) application, and prior to exploration drilling activities commencing.

Part 2: Provide information related to the function of biocides during offshore exploration drilling, the zone of influence when discharged, effects on target species versus incidental species, and as well as potential quantities that may be used.

Refer to the response to Part 1 above for information relation to the function of biocides during exploration drilling.

Completing an additional assessment, including the zone of influence when discharged and effects on target species versus incidental species, would be duplicative of the environmental protection elements already incorporated into the Chemical Selection Guidelines and OWTG. In addition, and as mentioned above, exploration drilling activities do not typically require biocides for cooling water, and biocides are limited to additives to WBM if pre-mixing and storage occurs.

As mentioned in the response to Part 1 above, the type and concentration of biocides to be used and discharged to the marine environment will be outlined, if applicable, in the ExxonMobil Canada Ltd. (ExxonMobil) and Equinor (herein referred to as the Operators) EPPs, which will be provided to the C-NLOPB for review and acceptance prior to commencing exploration drilling activities. Refer to the response to Part 3 below for the potential quantities that may be on board a drilling installation. The quantity used during an exploration drilling program will depend on whether well decommissioning is required, and whether WBM is pre-mixed and stored prior to use.

Part 3: Indicate the volume of biocide stored on the drilling installation during previous drilling programs, and evaluate the potential effects of an accidental spill of this stored volume on the surrounding environment and valued components.

Based on past Equinor exploration drilling programs (e.g., two-well drilling campaign), the quantity of biocides on the drilling installation were four sealed 205 litres (L) drums. However, this quantity

may be subject to change depending on the drilling mud contractor. Drums of biocides are typically stored in a designated storage room or in a closed lift container on the deck, therefore, there is no to low risk of the drums entering the marine environment by accident.

In the unlikely event of an accidental release of biocides to the marine environment it is predicted that there would be a rapid mixing of biocides with the surrounding waters. Although there are variable chemoreception and chemical avoidance capabilities by marine fish, marine and migratory birds, marine mammals and/or sea turtles (Clark 1997; Southwood et al 2007; Kremers et al 2016; Tierney 2016), the limited quantities potentially released, combined with the rapid dilution of chemical, and mobile nature of these species indicates that they would likely be unaffected by an accidental release. An accidental release would also not likely have an adverse effect on sensitive benthic species (e.g., corals, sponges) due to the distance to the seafloor and anticipated rapid mixing of biocides with surrounding waters. An accidental release of biocides to the marine environment does; however, have the potential to affect the surface microlayer, which is the upper millimetre or less of the water surface that is deemed habitat for many sensitive life stages of microorganisms (e.g., fish eggs, larvae) (ADEC et al 2008). Most studies on the surface microlayer have been completed in areas nearshore, however, some studies have focused on areas offshore and found that densities of larvae were similar to those found in nearshore environments (ADEC et al 2008). If an accidental release of biocides, occurred the surface area affected would be relatively small compared to the remainder of the offshore marine environment. The Operators recognize that ADEC et al (2008) is applicable to in-situ burning, which also has the potential to affect the surface microlayer. It is likely that an accidental release of biocides would have a similar, but likely lesser, effect as in-situ burning to the surface microlayer, and therefore it is expected that a rapid renewal of the surface microlayer from adjacent areas would occur (ADEC et al 2008).

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INFORMATION REQUIREMENT – IR-82-2

The Agency required consideration of noise level predictions from Appendix C in the evaluation of underwater noise effects on fish, including estimates of distance from source that noise levels will exceed thresholds for fish injury or behavioural effects.

The response provided a comparison of estimated source levels (drilling installation and support vessel) from Appendix C with published thresholds for fish injury, noting a lack of applicable thresholds for behavioural effects. A comparison with anticipated source levels for vertical seismic profile surveys (also discussed in Appendix C) was not provided. The response states that sounds levels would decrease (rapidly) with increasing distance from the source, but a distance at which thresholds would be exceeded (as requested in IR-82) was not provided.

Specific Follow-up Question/Information Requirement

Provide additional analysis of anticipated noise from vertical seismic profile surveys as compared to thresholds for effects on fish.

Estimate the distance from source (both drilling installation and vertical seismic profile surveys) that noise levels are anticipated to exceed thresholds for fish injury.

Response

As discussed in Appendix C of the Environmental Impact Statement (EIS) (Quijano et al. 2017), source levels for the vertical seismic profile (VSP) surveys were predicted using JASCO's Airgun Array Source Model, and the Schlumberger's Hypercluster Air Gun Array as a conservative example of a possible six-element array (Quijano et al. 2017). For this array, energy was predicted to be concentrated in the frequency band 10 to 315 hertz (Hz), with a broadband sound exposure level (SEL) of 222.6 decibels (dB) re 1 µPa2 @ 1 m (broadside) and 222.4 dB re 1 µPa2 @ 1 m (endfire). In comparison, the VSP array used in the Scotian Basin Exploration Drilling Project (Zykov 2016) was the Schlumberger Dual Magnum 2,400 cubic inches (in^3) airgun source array, with a predicted broadband SEL of 224.7 dB re 1 µPa2 @ 1 m (broadside) and 224.1 dB re 1 µPa2 @ 1 m (endfire), and with most of its energy concentrated in the 10 to 200 Hz frequency band.

Given the above source levels, Quijano et al. (2017) concluded that the distance to thresholds related to the seismic VSP measurements for this Project are likely to be smaller than those from the Scotian Basin Exploration Drilling Project, due to broadband levels that are approximately 2 dB or lower. This conclusion was also based on the observation that both arrays exhibit similar frequency content, with most energy at frequencies <315 Hz. While distances to fish injury thresholds were not calculated for this Project, based on the comparability of the above metrics, general predictions as to the distance at which thresholds may be exceeded can be estimated from the results of the Scotian Basin modelling work.

As noted in the original response to this Information Requirement (IR), Popper et al. (2014) published recommended sound exposure guidelines for fishes exposed to only certain types of sound sources. While explicit guidelines were not developed for VSP surveys, thresholds recommended for seismic air source array (generally higher source levels) are considered here. Popper et al. (2014) also provided different threshold values for different types of animals, distinguishing between fish species that have swim bladders involved in hearing (e.g., Atlantic cod, herring), those with swim bladders

that are not involved in hearing (e.g., Atlantic salmon), and those fish species with no swim bladder (e.g., flatfish). Table 1 presents the threshold levels for fish injury (both mortal and recoverable) for seismic air source array (from Popper et al. 2014) and the potential distances to these threshold levels based on modelling done for the Scotian Basin Exploration Drilling Project (Zykov 2016). Based on this comparison, a conservative estimate of noise levels indicates they are not anticipated to exceed thresholds for fish injury beyond 500 m from VSP surveys.

Table 1 Threshold levels for fish injury for seismic air source array (from Popper et al. 2014) and potential distances to these threshold levels based on modelling done for the Scotian Basin Exploration Drilling Project (Zykov 2016)

Type of Animal	Distance to (in km) and thresholds for (in dB) mortality and potential mortal injury		Distance to (in km) and thresholds for (in dB) recoverable injury	
	SELcum (re 1 µPa^2·s)	**peak SPL (re 1 µPa)**	**SELcum (re 1 µPa^2·s)**	**peak SPL (re 1 µPa)**
Fish with no swim bladder	between 0.04 - 0.16 km (>219 dB)	between 0.04 and 0.07 (>213 dB)	between 0.04 - 0.16 km (>216 dB)	between 0.04 and 0.07 (>213 dB)
Fish with swim bladder not involved in hearing	0.16 km (210 dB)	between 0.07 and 0.14 (>207 dB)	between 0.16 - 0.51 km (203 dB)	between 0.07 and 0.14 (>207 dB)
Fish with swim bladder involved in hearing	between 0.16 - 0.51 km (207 dB)	between 0.07 and 0.14 (>207 dB)	between 0.16 - 0.51 km (203 dB)	between 0.07 and 0.14 (>207 dB)

NB: Distances shown are the $R_{95\%}$ horizontal distances (in km) to modelled maximum-over-depth cumulative sound exposure level (SELcum) and 0-to-peak sound pressure level (peak SPL) thresholds, un-weighted, for the Scotian Basin Exploration Drilling Project. Distances were taken from Tables 18 and 26 of Zykov (2016). Where values in Tables 18 and 26 differed between winter and summer scenarios and/or Sites A and B in that study, the largest distance to possible threshold exceedance was selected for inclusion here. Thresholds for injury were taken from Table 7.4 of Popper et al. (2014). Where Popper et al. (2014) threshold values fall between the 10-dB level bins summarized in Zykov (2016), a range of threshold exceedance distances is provided above. For example, for a threshold of 207 dB, distance values for 200 dB and 210 dB are given.

With respect to threshold exceedance estimates for the drilling installation, source levels were presented in Appendix C of the EIS (Quijano et al. 2017) based on previously modelled levels for a drill ship, drilling platform, and support vessel (i.e., 197, 197, and 189 dB re 1 µPa @ 1 m, respectively; Zykov 2016). Fish injury threshold guidelines in Popper et al. (2014) are limited for continuous sound sources, but numeric values have been set for recoverable injury of fish species that have swim bladders involved in hearing (i.e., 170 dB root-mean-square [rms] for 48 hours [h]). As previously noted in the original response to this IR, sound levels are expected to dissipate rapidly with distance from the source. Based on the results of the Scotian Basin Exploration Drilling Project acoustic modelling, sound levels from the three sources were predicted to decrease to below the Popper et al. (2014) threshold for recoverable injury at distances of less than 150 m (Tables 14 and 15 of Zykov 2016).

In consideration of the information provided above, the effects assessment in Section 8.3.3 of the EIS, including the analysis of effects, proposed mitigation and follow-up, and significance predictions remain valid.

References

Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R.L. Gentry, et al. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. SpringerBriefs in Oceanography, Volume ASA S3/SC1.4 TR-2014. ASA Press. 87 pp.

Quijano, J., M.-N. Matthews, and B. Martin. 2017. Eastern Newfoundland Drilling Noise Assessment: Qualitative Assessment of Radiated Sound Levels and Acoustic Propagation Conditions. Document 01366, Version 2.1. Technical report by JASCO Applied Sciences for Stantec Consulting Ltd.

Zykov, M.M. 2016. Modelling Underwater Sound Associated with Scotian Basin Exploration Drilling Project: Acoustic Modelling Report. Document Number JASCO Document 01112, Version 2.0. Technical report by JASCO Applied Sciences for Stantec Consulting Ltd. http://www.ceaa.gc.ca/050/documents/p80109/116305E.pdf.

INFORMATION REQUIREMENT – IR-84-2

The Agency required additional information about additional collection of Indigenous Knowledge from Indigenous communities, and how this might be used in the design and implementation of follow-up and monitoring programs and further mitigations. The proponents responded that they anticipate receiving IK focused on species of interest in August 2018, and would advise further on this matter upon review of that information.

It is noted that responses to IR-16/16a, IR-22, IR-25, and IR-30 have provided additional information on the planning and development of potential follow-up and monitoring programs for Atlantic salmon, corals and sponges, marine mammals and sea turtles, and marine and migratory birds, respectively. However, the potential for participating Indigenous communities to participate in the planning and development of follow-up programs has not been discussed. Several Indigenous groups have expressed interest in remaining engaged throughout this phase of the Projects.

Specific Follow-up Question/Clarification:

Describe the on-going role of Indigenous groups in follow-up and monitoring plans, including for accidents and malfunctions, developed by Equinor and ExxonMobil.

Response

As outlined in Section 12.5 of the Environmental Impact Statement (EIS), ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) will continue to communicate with Indigenous groups through established and/or information engagement processes, as required and requested. The specific nature, frequency, subject matter, and format of such future engagement will be determined in discussion with the Indigenous groups and outlined in an *Indigenous Communities Fisheries Communication Plan (FCP)*. As outlined in Section 12.5 of the EIS, indigenous groups will be invited to participate in the development of the *Indigenous Communities FCP*, which will likely include aspects such as, but not limited to, communication objectives, list of participants and key contacts, Environmental Assessment update process that provides specific information of planned offshore operational activities for that year and provides opportunity for feedback and further exchange of information on specific aspects of interest, and expectations for communications during the unlikely event of a major spill.

The Operators will share their plans for monitoring and follow-up programs with Indigenous groups during upcoming and ongoing engagement. Throughout all phases of the Project, the Operators will continue to engage with interested Indigenous groups and provide updates regarding the implementation of monitoring and follow-up programs, and will share the results of these programs.

References

N/A

INFORMATION REQUIREMENT – IR-86-2

The Agency required an updated assessment of the potential cumulative environmental effects on migratory birds (specifically Leaches Storm Petrel) and marine mammals, including but not limited to the spatial extent of effects from key activities (i.e. lights on birds) and cumulative effects of creating multiple zones of avoidance in the project area.

ECCC has indicated that the proponents have not adequately supported their assessment of migratory bird attraction distances; additional discussion and references are required regarding the level of certainty for the attraction distances stated and to support the conclusion of no or few cumulative effects.

ECCC additionally noted that the proponents stated "…foraging tracks illustrated in the study did not show evident clustering around the production areas…", which refers to Hedd et al. 2018. ECCC advised that the tracks used in Hedd et al. 2018 cannot show clustering and therefore should not be consulted with respect to clustering. All birds referenced in Hedd et al. 2018 passed through the Project area, and therefore would be vulnerable to light attraction.

ECCC further advised that the location of the Projects is in direct line with Leach's Storm-petrel foraging paths from Baccalieu Island. Tracks show Baccalieu birds travelling through the Project area; cumulative impacts may thus occur on the Atlantic population of Leach's Storm-petrel. Tracking data currently shows birds from three of the four colonies tracked pass through current production areas, of which only Leach's Storm-petrel from Baccalieu Island do not. Leach's Storm-petrel from all four colonies would be exposed to the risks posed by lit platforms as a result of the Projects. ECCC noted that Baccalieu Island is the largest colony of Leach's Storm-petrels in the world and in significant decline.

Specific Follow-up Question/Information Requirement

Taking into account the information provided by ECCC, provide additional discussion on the level of certainty for the attraction distances stated, as well as references to support the conclusion of no or few cumulative effects.

In addition, provide a reference for the following statement in the proponents' response: "…foraging tracks illustrated in the study did not show evident clustering around the production areas". The response refers to Hedd et al 2018; however, as noted by ECCC, this research should not be consulted with respect to clustering.

Response

Part 1: Taking into account the information provided by ECCC, provide additional discussion on the level of certainty for the attraction distances stated, as well as references to support the conclusion of no or few cumulative effects.

The original response to this Information Requirement (IR) discussed available studies on attraction of birds to offshore lighting from oil and gas facilities that demonstrated attraction distances of less than 2 kilometres (km) for gas flaring (Day et al 2015) to 5 km for a production platform with full lighting (30 kilowatts [kW]) (Poot et al 2008), although attraction from distances of greater than 5 km could not be ruled out in the Poot et al (2008) study. Taking into consideration the information

provided by Environment and Climate Change Canada (ECCC), additional information is brought forward regarding a recent global positioning system (GPS) tracking study on the related Cory's shearwater, which found that fledging birds from colonies up to 16 km away from the Island of Tenerife were susceptible to stranding due to light attraction, and short-tailed shearwaters in Australia have been found stranded at a plant 15 km from the nearest breeding colony, suggesting that attraction distances of anthropogenic light sources may be greater than 5 km (Rodriguez et al 2014, 2015). While there is uncertainty with respect to attraction distances due to lighting attraction from offshore oil and gas facilities, it is of note that the Project activities will emit less light than a fully lit production platform, and therefore, the spatial extent of lighting attraction is predicted to be smaller.

The conclusion associated with cumulative effects outlined in the original response to this IR remains valid (i.e., Project activities in this area will not overlap with those of the current production facilities), which includes light emissions that may attract and/or disorient night-flying birds, even if a conservative estimate of 16 km attraction distance due to artificial lighting (as reported in Rodriguez et al 2015) is assumed.

Part 2: In addition, provide a reference for the following statement in the proponents' response: "…foraging tracks illustrated in the study did not show evident clustering around the production areas". The response refers to Hedd et al 2018; however, as noted by ECCC, this research should not be consulted with respect to clustering.

The original response to this IR stated the following, "The foraging tracks illustrated in the study did not show evident clustering around the production areas, although this was not quantified in the report". This statement is retracted as the Hedd et al (2018) report did not analyse whether birds spent more time around the production areas than would be expected by chance.

References

Day, R.H., J.R. Rose, A.K. Prichard and B. Streever. 2015. Effects of gas flaring on the behavior of night-migrating birds at an artificial oil-production island, Arctic Alaska. Arctic, 68(3): 367-379.

Hedd, A., I.L. Pollet, R.A. Mauck, C.M. Burke, M.L. Mallory, L.A. McFarlane Tranquilla, W.A. Montevecchi, G.J. Robertson, R.A. Ronconi, D. Shutler, S.I. Wilhelm and N.M. Burgess. 2018. Foraging areas, offshore habitat use, and colony overlap by incubating Leach's storm-petrels Oceanodroma leucorhoa in the Northwest Atlantic. Public Library of Science ONE, 13(5): e0194389.

Poot, H., B.J. Ens, H. de Vries, M.A.H. Donners, M.R. Wernand and J.M Marquenie. 2008. Green light for nocturnally migrating birds. Ecology and Society, 13: 47.

Rodrıguez, A., G. Burgan, P. Dann, R. Jessop, J.J. Negro and A. Chiaradia. 2014 Fatal attraction of short-tailed shearwaters to artificial lights. PLoS ONE 9(10): e110114.doi:10.1371/journal.pone.0110114

Rodríguez, A., B. Rodriguez and J.J. Negro. 2015. GPS tracking for mapping seabird mortality induced by light pollution. Sci. Rep., 5, 10670; doi: 10.1038/srep10670.

INFORMATION REQUIREMENT – IR-87-2

Based on a concern raised by Mi'gmawe'l Tplu'taqnn Incorporated, the Agency required additional information on how magnitude is defined in relation to the range of accident types that can occur and how this criterion would be used to determine potential spill responses. The proponents responded with information on the three-tiered approach to spill response, indicating that further information would be available in each Project's Oil Spill Response Plan, to be submitted to the C-NLOPB as part of the Operations Authorization process.

Indigenous groups have expressed interest in participating in the development and implementation of these plans.

Specific Follow-up Question/Clarification:

Confirm the level of involvement of Indigenous groups in the development and implementation of the OSRP and other emergency response and preparedness plans, exercises and training. Confirm if Indigenous groups will be provided with versions of these plans when they are finalized.

Response

The development and implementation of Oil Spill Response Plans (OSRPs) for ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) incorporates information and best available technology for oil spill response. A series of workshops occurred in Moncton, New Brunswick (NB), Quebec City, Quebec (QC), and St. John's, Newfoundland and Labrador (NL) in April 2018 and included representatives from Indigenous groups and organizations, offshore operators, including the Operators, and regulatory agencies. Oil spill response was a topic of discussion during the workshops in April 2018. Offshore operators, including the Operators, are currently planning follow-up workshops, which are anticipated to occur in the same three locations in October 2018, and a portion of the workshop will focus on oil spill preparedness and response, and will also provide a forum to follow-up on any issues or concerns brought forward in the April 2018 workshops.

Ongoing collaboration and engagement prior to exploration drilling will provide opportunities to continue to share content and information associated with oil spill response with Indigenous groups and will also provide an opportunity to bring forward any concerns or issues associated with oil spill response to the Operators. The Operators commit to providing their final OSRPs to Indigenous groups.

The Operators have dedicated emergency response teams (ERTs), or similar, that would be involved in an actual emergency, as well as any response exercises. Personnel on the ERTs receive training specific to oil spill response, which may include safety aspects, response management (e.g., emergency response procedures), spill response equipment deployment, and response operations; details associated with training will be outlined in the OSRPs. As indicated in Section 15.1.2.1 of the Environmental Impact Statement (EIS), response exercises are conducted to confirm readiness. For response exercises to be effective and representative of an actual emergency, they are conducted by Operator personnel who are a part of the ERTs, and therefore Indigenous groups will not be involved in response exercises. The Operators are, however, open to sharing results and learnings from response exercises, if requested by Indigenous groups.

References

N/A

INFORMATION REQUIREMENT – IR-89-2

The Agency required information on the potential for contamination of country foods by a spill, the potential for health effects from consumption of contaminated country foods, as well as the potential adverse effects of perceived contamination of country foods.

The proponents provided a rationale for a lack of pathway for interactions resulting in contamination and associated health effects from consumption. They indicated that spill modelling showed low potential for a spill to reach shorelines, and that modelling was for worst-case, unmitigated scenarios; actual geographic extent and magnitude of a spill would be reduced owing to spill response measures.

Specific Follow-up Question/Information Requirement:

Despite the lack of pathway for effects, in the event of a blowout or large-scale spill, there is the potential for the perception of contamination of affected fish, bird and mammal species. Provide a discussion of:

- available information on whether this effect was observed during previous large-scale spills, even when actual contamination was not observed;
- potential effects of perceived contamination on Indigenous communities being consulted as part of this environmental assessment; and
- monitoring, communication and information-sharing efforts that will be undertaken to address perceptions and mitigate potential effects on communities.

Response

Part 1: Despite the lack of pathway for effects, in the event of a blowout or large-scale spill, there is the potential for the perception of contamination of affected fish, bird and mammal species. Provide a discussion of available information on whether this effect was observed during previous large-scale spills, even when actual contamination was not observed.

The Deepwater Horizon incident occurred in April 2010 in the Gulf of Mexico, and approximately 66 kilometres (km) off the coast of Louisiana (Britannica nd). The incident released approximately 4.9 million barrels of oil over a five-month period and affected more than 966 km of Gulf Coast shoreline in Florida, Alabama, Louisiana, and Texas (Morris et al 2013). The incident also resulted in temporarily closing an area of approximately 229,271 square kilometres (km^2) within the Gulf of Mexico (Morris et al 2013).

As part of the Deepwater Horizon Research Consortium, several university research groups studied the recovery and resiliency of individuals and communities affected by the spill over a five-year time-period (AMA 2014). As outlined in Morris et al (2013), initial studies that occurred while the oil spill was in progress showed high levels of anxiety and depression in people living in coastal communities, and income loss as the main factor. The Morris et al (2013) study continued to study people and communities and found that a year after the spill there was no significant change in the levels of anxiety or depression, and income loss continued to be the main factor. As outlined in AMA (2014), two years after the spill approximately 20% of the population was still experiencing depression; however, three years after the spill depression levels reduced back to near baseline.

The Morris et al (2013) study also focused on four coastal communities in the north-eastern Gulf Coast region that were selected due to their dependence on tourism and seafood harvesting. It was found that there was a perception that the entire Gulf of Mexico was polluted, and all seafood was contaminated, even though there was little direct oil contamination in the north-eastern Gulf Coast region (Morris et al 2013).

It is noted that there have been studies completed on other major spills; however, the Deepwater Horizon incident is recent and therefore was a prime focus in the response to this Information Request (IR).

Part 2: Despite the lack of pathway for effects, in the event of a blowout or large-scale spill, there is the potential for the perception of contamination of affected fish, bird and mammal species. Provide a discussion of potential effects of perceived contamination on Indigenous communities being consulted as part of this environmental assessment.

As mentioned in the response to Part 1, the perception of contamination was observed from the Deepwater Horizon incident in coastal communities that had little direct oil contamination; however, approximately 966 km of shoreline was affected by this incident. The Gulf of Mexico has approximately 2,626 km total shoreline (NOAA nd), and therefore approximately 37% was affected by the Deepwater Horizon incident.

Indigenous communities being consulted as part of this environmental assessment are in Newfoundland and Labrador (NL), Nova Scotia (NS), New Brunswick (NB), Prince Edward Island (PEI) and Quebec (QC). The Project Area is located a considerable distance offshore, and approximately 300 km to 600 km from St. John's, NL, and therefore significantly greater distances (e.g., approximately 700 km to 1,500 km) to Indigenous communities in NL, NS, NB, PEI, and QC. In addition to the significant distances of the Project Area to Indigenous communities in NL, NS, NB, PEI, and QC, the results of the spill trajectory modelling in Appendix E of the Environmental Impact Statement (EIS) also indicated a low probability of shoreline oiling in the event of an unmitigated subsea blowout. The perception of contamination and associated potential effects that may be experienced (e.g., anxiety) are difficult to quantify or measure a comparison of the circumstances associated with the Deepwater Horizon incident (e.g., location offshore, impacted shoreline) are vastly different than those associated with the Project Area, in the rare event of a subsea blowout (e.g., significantly greater distance offshore, low probability of shoreline oiling). The overall risk and impact is significantly less offshore Newfoundland when compared to the Gulf of Mexico, and measures described below would contribute to addressing perceptions and mitigating potential effects on communities.

Part 3: Despite the lack of pathway for effects, in the event of a blowout or large-scale spill, there is the potential for the perception of contamination of affected fish, bird and mammal species. Provide a discussion of monitoring, communication and information-sharing efforts that will be undertaken to address perceptions and mitigate potential effects on communities.

In the rare event of a subsea blowout, and with specific reference to Indigenous groups, a loss or perceived loss would likely not be limited to direct economic impact and food value and, in turn, potential psychological effects such as anxiety and depression, but can also extend to ceremonial and spiritual aspects associated with traditional foods. In the event of contamination, or perceived contamination, it is of importance to communicate with communities and Indigenous groups including

delivering information programs that may assist in understanding the incident and associated impacts, or lack of impacts. As outlined in Section 12.5 of the EIS, ExxonMobil Canada Ltd. (ExxonMobil) and Equinor Canada Ltd. (Equinor) (herein referred to as the Operators) will develop *Indigenous Communities Fisheries Communications Plans (FCPs)*, which will include expectations for communications during the unlikely event of a major spill. As indicated in the response to IR-84-2, Indigenous groups will be invited to participate in the development of the *Indigenous Communities FCPs*. In the unlikely event of subsea blowout, it may be beneficial to consult with applicable community leaders to assist with programs to inform the community members and help with delivering resiliency programs to the communities.

References

AMA (American Psychological Association). 2014. After the Spill – Researchers study the lingering effects of the BP oil spill. Available online: http://www.apa.org/monitor/2014/07-08/spill.aspx. Accessed September 2018.

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COMMON CLARIFICATIONS

EQUINOR AND EXXONMOBIL

CLARIFICATION – CL-08-2

The clarification requires that the proponent provide the reference(s) that support the text in the EIS that states "(i)n situ experiments indicate that salmon in natural conditions (not in a lab or a cage) can likely detect hydrocarbons at concentrations approximately ten percent of those shown to cause mortality and avoid them." The proponent provided a list of references, however, did not specify which reference contained the statement in question. Upon review of the references, this statement could not be found.

Specific Follow-up Question/Clarification:

Specify which reference contains the phrase in question, or explain how this statement was deduced from the published literature referred to in the proponents' response.

Response

The phrase in question is not directly from a reference but from a deduction of two references (Barrett and Toews 1978; Weber et al 1981). Summary information related to these references are provided in Sections 15.5.5.1 and 15.5.5.2 of the Environmental Impact Statement (EIS).

Experiments on salmon using oil in a non-cage environment are uncommon; however, Weber et al (1981) conducted avoidance experiments with Pacific salmon and the water-soluble fraction of Prudhoe Bay crude oil at a fishway system on Chambers Creek, Puget Sound, Washington. They determined that the concentration where 50% of the salmon that were expected to ascend a fishway but avoided it was 3.2 milligrams per litre (mg/L).

A separate study by Barnett and Toews (1978) determined the acutely lethal concentration of oil (Venezuelan crude oil) on post smolt Atlantic salmon (*Salmo salar*) in a lab environment. Fish were exposed for 96 hours to various concentrations of oil ranging from 10 mg/L to 560 mg/L. The upper concentration that was tested where no mortality was recorded was 32 mg/L.

Based on these references, salmon are capable of detecting concentrations of oil in an un-caged scenario at 3.2 mg/L and concentrations that conservatively could be considered an upper limit before mortality occurs were measured at 32 mg/L; therefore, it was conservatively deduced that salmon can likely detect hydrocarbons at concentrations approximately 10% (3.2 mg/L) of those shown to cause mortality (conservatively estimated at 32 mg/L) and avoid them.

It should be noted that the estimated 96-hour lethal concentration (LC50) (i.e., the concentration where mortality would occur in 50% of the salmon exposed for 96 hours) in the Barnett and Toews (1978) study was 99 mg/L (95% confidence interval of 86.09-113.85 mg/L), which would reduce the detection concentration compared to mortality concentration to approximately 3%. The lowest concentration where 100% of salmon held in the tank died in Barnett and Toews (1978) was 130 mg/L. The upper tested limit where no mortality occurred (32 mg/L) is therefore a conservative concentration for comparison to avoidance behaviours.

References

Barnett. J. and D. Toews. 1978. The effects of crude oil and the dispersant, Oilsperse 43, on respiration and coughing rates in Atlantic salmon (*Salmo salar*). Can. J. Zool., 56: 307-310.

Weber, D.D., D.J. Maynard, W.D. Gronlund and V. Konchin. 1981. Avoidance reactions of migrating adult salmon to petroleum hydrocarbons. Can. J. Fish. Aquat. Sci., 38: 779-781.

CLARIFICATION – CL-20-2

The clarification requires that the proponent to provide the rationale as to why a lower resolution data set was used for oil spill model versus a high one for the HYCOM model when the source of the data (CFSR) was the same. The proponent provided an explanation of the differences between the HYCOM model and CFSR data set. The intent of the clarification was not addressed in the response.

Specific Follow-Up Question/Clarification

What is the rationale for the use of a lower resolution wind data set from the CSFR to force the oil spill model (i.e. 6 hourly winds at a 0.5 degree spatial resolution) when a higher resolution wind data set is available (i.e. 1-hour winds at 0.3125 degree spatial resolution)? What differences, if any, would be expected in the outcomes of the oil spill modelling scenarios if the high resolution data set was used to force the model?

Response

The U.S. Navy Global HYCOM (HYbrid Coordinate Ocean Model) circulation model (i.e., HYCOM hydrodynamic model) and the U.S. National Centers for Environmental Prediction Climate Forecast System Reanalysis model (i.e., CFSR wind model) are two separate data products. Each model is generated by different groups of scientists using different input data sets, to model different fluids (air vs. water). The spatial and temporal resolution of the models do not match exactly, nor should they. The movement of ocean currents does not “force” winds; however, winds can and do “force” the movement of water. Hydrodynamic models use wind speed and direction as an input dataset to drive upper ocean movement (i.e., surface currents). Specifically, the HYCOM model uses the CFSR wind model as the wind forcing. Therefore, to ensure consistency within the forcing datasets, the HYCOM and CFSR models were used in tandem as forcings to the oil spill model.

If a different wind data set were used, then the forcings would not be coupled or consistent. In essence, surface water would be transported based upon CFSR winds (and other HYCOM inputs), while the oil would be transported by a combination of HYCOM currents (driven by CFSR winds) and winds from the hypothetical other wind model. This de-coupling would be inconsistent and would be a limitation to the oil spill model.

The 6-hourly CFSR winds at 0.5-degree spatial resolution were used in this modelling exercise as opposed to the 1-hour winds at 0.3125-degree spatial resolution for several reasons. Primarily, the data in question have a different projection, which result in gaussian stretching in latitude at the northern regions, due to the curvature of the Earth. This would result in non-uniform spatial coverage with this high-resolution dataset. Secondarily, the coarser resolution wind data that were used in this analysis are optimal for storage file size and model run time. Additional resolution would inflate storage sizes and increase run times (i.e., the time it takes to simulate these releases). The result of this would be only very small differences in the oil spill trajectory over long periods of time (e.g., months to years). While the finer scale features in the high-resolution winds may capture a small amount of mesoscale variability, the intent of this analysis is to capture longer time-scale and spatial patterns in wind / wave coupling and the potential for entrainment of oil. This dataset is not required to capture these features. Finally, based upon the spatial and temporal scales of the oil spill analysis, and use of daily HYCOM currents, the use of this higher resolution would not add value to the variability of the oil spill results.

References

N/A