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Equinor Canada Ltd

Bay du Nord Development Project

Environmental Impact Assessment (Draft)

Response to Regulatory Review Information Requests

November 2019

Bay du Nord Development Project Environmental Impact Statement (draft) Response to Regulatory Review Information Requests (CEAR 80154)

November 15, 2019

AU-TPD-PM539-002

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1 Introduction

This document includes the responses from Equinor Canada Ltd. to information requests from regulatory agencies resulting from their review of the draft Bay du Nord (BdN) Development Project Environmental Impact Statement (EIS) (Equinor Canada Ltd. 2019) submitted to the Canadian Environmental Assessment Agency in February 2019.

The document is organized as follows:

- Section 1.0 provides an introduction to this response document.
- Section 2.0 includes the responses to the regulatory information requests (IRs).
- Section 3.0 includes amendments to Chapter 2 of the EIS to reflect updated information related to air emissions.

2 Responses to Information Requests

For the following responses to information requests, where text changes and/or amendments to the EIS are noted, new text is shown as bold italics and deleted text is shown as strikethrough. New references to be included in the EIS are highlighted in bold and italics.

IR-no number **ECCC-7**	**Guideline Ref:** Part 2, Section 3.1	**EIS Ref:** Section 2.7.1.5
Context/Rationale	Section 2.7.1.5 of the EIS states that "production facilities discharging produced water on NCS (Norwegian Continental Shelf) achieve oil-in-water concentrations lower than 30 mg/L, and some facilities have an annual average of 15 mg/L (Steinar et al. 2016)" The reference for Steinar et al. 2016 was not available in the Literature Cited section of Chapter 2, and thus this information cannot be verified.	
Request **15-Apr-19**	Provide the reference for Steinar et al. 2016 in the Literature Cited section of Chapter 2.	
Equinor Response **15-Nov-19**	The reference, as noted, should read (Nesse et al. 2016). The reference is included in the EIS Chapter 2 Reference list (Section 2.11.2) and is as follows: Nesse, S., E. Garpestad, and E. Gragsund. 2016. Produced Water Management Under the Norwegian "Zero Harmful Discharge Regime" – Benefits with the Risk Based Approach. Society of Petroleum Engineers. https://doi.org/10.2118/179326-MS. The four instances of reference to (Steinar et al. 2016) in Section 2.7.1.5 will be amended to read as ***"(Nesse et al. 2016)"***	

IR-1 **C-NLOPB-1**	**Guideline Ref:** Part 2, Section 1.4	**EIS Ref:** Section 1.3.2.2, Table 1.1
Context/Rationale	In Section 1.3.2.2 of the EIS, the Summary of Key Relevant Legislation, Regulations, and Guidelines is incomplete. There is no mention in the EIS to the likelihood that the new Frontier and Offshore Regulatory Renewal Initiative and Occupational Health and Safety Regulations will be in force by late 2020 and may involve new/changing requirements for operators.	
Request **15-Apr-19**	Update the EIS to include the likelihood that the new Frontier and Offshore Regulatory Renewal Initiative and Occupational Health and Safety Regulations will be in force by late 2020 and may involve new/changing requirements for operators.	
Equinor Response **15-Nov-19**	EIS Section 1.3.2.2 will be amended by inserting new text in Section 1.3.2.2 immediately prior to the paragraph beginning "Another aspect of the C-NLOPB's mandate is the administration of the provisions of the Accord Acts….": The following text will be included in Section 1.3.2.2: ***"Equinor Canada is also aware that the Frontier and Offshore Regulatory Renewal Initiative (FORRI) is ongoing and is likely to result in the development of a suite of new operational requirements for frontier and offshore oil and gas activities in Canada, termed the 'Framework Regulations'. Equinor Canada is also aware that concurrent to FORRI's work, the Atlantic Occupational Health and Safety Initiative is modernizing the occupational health and safety***	

	regulations for offshore oil and gas activities in Canada with the aim of enhancing the already high standards for safety, environmental protection, and resource management in offshore oil and gas areas of Canada. These reforms are anticipated to be in force in late 2020 at which time Equinor Canada will review and determine their applicability to the Project."

IR-2 **DFO-35**	**Guideline Ref:** Part 1, Section 4.2.3	**EIS Ref:** Section 1.0 (and throughout entire EIS document)
Context/Rationale	Despite outlined shortcomings of the Eastern Newfoundland Strategic Environmental Assessment (SEA) (Amec 2014) document identified by DFO (2014), the Proponent maintains it is a foundational source of information. Many of the shortcomings initially identified in the SEA (DFO, 2014) are also present in the EIS. For example, shortcomings regarding NAFO operations and use of Vulnerable Marine Ecosystems (Section 6.4).	
Request **15-Apr-19**	Revise the Bay du Nord Development Project EIS based on comments formally communicated by DFO in 2014 on the Eastern Newfoundland Strategic Environmental Assessment.	
Equinor Response **2-May-19**	Equinor Canada responded to this IR in May 2019. The following information was provided: *This information is outside the scope of the environmental assessment.*	
DFO Response **10-Jun-19**	Upon further review and discussion, DFO concurs with Equinor's response pertaining to the IR as worded. Equinor should ensure that the EIS contains adequate descriptions of NAFO operations and VMEs.	
Equinor Response **15-Nov-19**	As indicated in response to IR-191/DFO-54, the EIS will be updated to provide accurate descriptions of the VMEs, portions of which are closed by NAFO through the *Fisheries Act*. Distances and intersections have also been calculated for the updated VMEs in the RSA. The addition of this information will not result in changes to the conclusions of the EIS.	

IR-3 **DFO-General** **CEAA-01**	**Guideline Ref:**	**EIS Ref:** Section 2.0
Context/Rationale	Throughout Chapter 2 of the Bay du Nord Development Project Environmental Impact Statement (EIS), the Flemish Pass Exploration Drilling Program Environmental Impact Statement (Statoil 2017) is referenced regarding drilling activities as a substitute for providing complete information in the Bay du Nord Project. The Bay du Nord Development Project EIS must be a complete stand alone document that fully describes the Project, its associated activities, and the potential effects (e.g. emissions estimates), and facilitates technical, public, and Indigenous groups review. This information is required to assess the potential environmental effects of the Project	
Request **10-Jun-19**	Provide the complete information on all project activities in Section 2.0 of the Bay du Nord Development Project Environmental Impact Statement within the document.	

Equinor Response 15-Nov-19	The Guidelines do not require that the Bay du Nord Development Project EIS be a “complete stand-alone document”. Rather, Part 1, Section 4.2.3 of the Guidelines encourages the proponent to make use of existing information relevant to the Project by either including “the information directly in the EIS” or by clearly directing the reader “to where it may obtain the information (i.e. through cross-referencing).” Further, Part 2, Section 3.1 of the Guidelines states “[w]here information can be based on previous experience, this will be presented as such.” The Flemish Pass Exploration Drilling EIS was completed in 2017 and the results of that assessment remain current and available to regulators, Indigenous groups and the public. The 7 instances in which the Exploration Drilling EIS is cross-referenced in Chapter 2 of the Bay du Nord Development Project EIS represent instances in which the activities or components of exploration drilling are identical to those described in the Bay du Nord EIS and are thus relevant. Therefore, reference to the Flemish Pass Exploration Drilling EIS is consistent with the Guidelines. Updates to the EIS are not required.

IR-4 **DFO-36**	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 2.1
Context/Rationale	Section 2.1 of the EIS stated that “ Crude oil shipping (including movement, hook-up / disconnect and offloading of crude oil to shuttle tankers within the Project safety zone)”. “Production operations offshore NL utilize the Basin Wide Terminal and Transshipment Solution (BWTTS), which is a fleet of modern shuttle tankers that ships crude to an existing transshipment terminal in NL or direct to market.” However to the contrary, the proponent notes that the transshipment of oil (i.e. “movement”) produced by this project is not considered within the scope of this Project, yet transshipment is considered as part of the “Basin Wide Terminal and Transshipment Solution”.	
Request 15-Apr-19	A. Describe how transshipment of oil is considered as part of the Basin Wide Terminal and Transshipment Solution is included in the cumulative effects assessment for Bay du Nord. B. Provide in the study area map the shuttle tanker route between the project areas and the NL transshipment terminal.	
Equinor Response 15-Nov-19	A. The reference to “Basin Wide Terminal and Transshipment Solution” is incorrect. The existing text in Section 2.1 will be amended to read as: “Basin Wide Terminal and Transshipment ***System***.” The transshipment of crude oil is not within the scope of the Project, per the EIS Guidelines. The EIS Guidelines Part 1, Section 3.1 clearly indicates that the Scope of the Project includes "Crude oil shipping including movement, hook-up/disconnect and offloading of crude oil to shuttle tankers within the Project safety zone." The EIS considered effects associated with tankers within the safety zone. Additionally, the Guidelines Part 2, Section 3.1, require the proponent to describe the project “by presenting the project components, associated and ancillary works…that will assist in understanding the environmental effects”. Part 2, Section 3.1 “requires the proponent to describe tankers, including their frequency and capacity, how and from where they are sourced, and their routes to and from the Project". The information in the EIS on tanker use in offshore Newfoundland, which referred to the "Basin Wide Terminal and	

	Transshipment System", or BWTTS was provided to satisfy this Guideline requirement. B. Refer to IR-14/Conformity CEAA-7 regarding Equinor Canada's response to shipping routes.

IR-5 **DFO-37**	**Guideline Ref:** Part 2, Section 3.1	**EIS Ref:** Section 2.1
Context/Rationale	In Section 2.1 of the EIS the proponent proposes to drill 5 to 20 production wells, 5 to 20 injector wells, and possibly pilot wells. The assessment of pilot wells is unclear as these wells were not described as to their purpose or inclusion into the total well count. This information is required to understand all Project activities and assess environmental effects of all Project activities.	
Request **15-Apr-19**	A. Provide rationale regarding inclusion or exclusion of pilot wells in the various modelling scenarios (e.g. inclusion in the total number of wells assessed) B. Describe characteristics (e.g., type of drilling mud used, discharge locations, etc.) of these pilot wells relative to production and injector wells modeled.	
Equinor Response **15-Nov-19**	A. A pilot well is drilled to assess potential shallow hazards. Therefore, they are shallow wells (i.e. top hole sections, likely up to 500 m) drilled with seawater and/or WBM. Based on preliminary design, if pilot wells are to be drilled they will likely be drilled approximately 25 m from the template location. Abandonment of a pilot well would be in accordance with the regulatory requirements for well decommissioning (as described in Section 2.6.7.2 of the EIS). Pilot wells are included in the total well count provided in the EIS (i.e., up to 60 wells for Core BdN Development and Potential Future Development). B. Drill cuttings dispersion modelling modelled a single well or multiple wells using WBM (i.e., riserless drilling), and therefore included the possibility of drilling pilot wells. For clarification the following text will be added to Section 2.3 of the EIS: "Potential well count (which includes side tracks ***and pilot wells***) may range from five to 20 production wells and five to 20 injection wells depending on the outcome of ongoing field development evaluations, delineation of the reservoirs through development drilling and evaluation of future improved oil recovery opportunities. Pilot wells may be required to provide additional information on the reservoir, ***in particular the assessment of shallow hazards,*** before development wells are drilled. ***These wells are typically drilled at depth up to 500m and within 25m of the template location."***	

IR-6 **C-NLOPB-1**	**Guideline Ref:** Part 2, Section 3.2	**EIS Ref:** Section 2.1.1, Table 2.1
Context/Rationale	In Table 2.1 in Section 2.1.1 of the Bay du Nord Development Project Environmental Impact Statement (EIS), although drilling activities may not occur continuously over the life of the project, 3 to 5 years of drilling activities for a 15 to 20 year life and possibly 30 years seems insufficient for the number of wells proposed.	

Request 10-Jun-19	Provide information on when and what drilling activities will occur during the life of the project to support the rationale for 3 to 5 years of drilling.
Equinor Response 15-Nov-19	As indicated in the EIS, the project design is ongoing. The projected maximum of five years of drilling activities is an estimate, as indicated in Table 2.1. It is based on the range of possible wells to be drilled for the Core Bay du Nord Development (Table 2.6; 10 to 40 wells) and does not include the drilling of wells that may be carried out should future development be undertaken. The duration of drilling activities during future development would be dependent on the number of wells required at that time. Should drilling activities take longer than the estimated five year maximum, the timeframe over which drilling could occur would be extended. However, the effects assessment is based on the duration of the effect, not the duration of project activities (see IR-152/CEAA-75) and therefore would not alter the effects predictions for drilling activities.

IR-7	**Guideline Ref:** Part 2, Section 3.2	**EIS Ref:** Section 2.1.1, Table 2.1
C-NLOPB-2		
Context/Rationale	In Table 2.1 in Section 2.1.1 of the Bay du Nord Development Project Environmental Impact Statement (EIS) , Short term supporting surveys (weeks or months) could start as soon as 2020 and occur throughout the life of the Project. Not all geophysical activities could actually occur year-round because of the presence of sea ice.	
Request 10-Jun-19	Describe what times of year geophysical activities are more likely to occur.	
Equinor Response 15-Nov-19	Geophysical activities, notably 2D/3D seismic surveys are typically carried out offshore NL from April to November of any one year, depending on sea ice conditions. However, as described in Section 2.6.5 geophysical activities include VSPs as well as 4D surveys. Depending on the method for a VSP, it could be carried out at any time of the year. Therefore, to ensure the temporal scope of the EIS is all inclusive, geophysical activities have a temporal scope year-round. Updates to the EIS are not required.	

IR-8	**Guideline Ref:** Part 2, Section 3.2	**EIS Ref:** Section 2.5.3.1
C-NLOPB-3 CEAA-2		
Context/Rationale	In Section 2.5.3.1 of the EIS, Equinor states, “During normal operations, the number of personnel on board are (sic) expected to be significantly less than the maximum of approximately 110. Utilities, such as the galley, food storage areas, change rooms and laundry, potable water and sewage treatment will be sized accordingly.” There were also no personnel counts for the one or two MODUs. Well maintenance, workovers and interventions are not described in terms of MODU presence, discharge and emissions, and support vessels, and how they may cause changes in the marine environment. Simultaneous operations are likely to cumulatively increase emissions and discharges in the Core BdN Development Area and Project Area and these scenarios are not provided. This information is required to understand and assess the potential environmental effects of the Project.	

Request **15-Apr-19**	A. Provide estimates of maximum personnel expected to be onboard the floating production, storage and offloading (FPSO) and mobile offshore drilling units (MODUs) during normal and maintenance operations. B. Quantify the volume of liquid and solid waste discharges and the zones of influence in a cumulative manner over various project phases, where applicable using the estimates provided in a). C. Describe well maintenance activities (i.e. workovers and intervention) and associated vessels (support and MODUS) and assess this planned phase in regard to vessel presence, operational emission and discharges and cumulative emissions and discharges with other Project vessels.
Equinor Response **2-May-19**	A. Equinor Canada responded to Part A on 2-May-19 with the following response *This level of detail will be provided in the Development Application. Estimated Maximum POB values are provided in the EIS.*
C-NLOPB/CEA Agency Response **10-Jun-15**	A. Equinor has not answered our question adequately by directing us to the EIS where the estimated maximum POB is provided, not POB during normal operations. We'd like to know the number of people onboard during normal operations to properly ascertain routine discharges during normal operations. To have it dealt with at the Development Plan is not appropriate when it can easily be dealt with in the EIS.
Equinor Response **15-Nov-19**	A. As stated in Section 2.5.3, the FPSO will be designed to accommodate a maximum of 110 personnel, which means utilities such as galley, food storage, rooms, laundry, potable water and sewage treatment will be sized to accommodate the maximum number of personal. The effects assessment uses the maximum potential volume associated with the maximum number of personnel on-board, thereby providing a conservative assessment of potential effects. As indicated in the EIS, the Project is in the early stages of design. The number of personal required for normal operations is under evaluation. While the maximum number of persons is not likely during normal operations, it is likely during hook-up and commissioning, maintenance and turnover activities, therefore the effects assessment must consider the maximum volume of discharges over the life of the project. This approach is consistent with the assessment of other discharges and emissions from the Project. As stated in Section 2.5.3 of the EIS, as project design is ongoing, "the design basis values listed are representative of peak production and provides for ranges in design criteria to allow for optimization to Project design. The EIS will, therefore, use the upper limit of these ranges in the associated environmental effects assessment." B. The volume of liquid wastes is provided in Table 2.21. The discharge rates are based on design criteria for maximum number of personnel onboard. See response to IR-13/CEAA-6;DFO-1 regarding zones of influence and effects assessment, including intra-Project effects, from Project discharges. C. Well maintenance activities are described in Section 2.6.3.3. Discharges are described in Section 2.6.3.2 and 2.8.2.2 and updated in response to IR-13/CEAA-6; DFO-1. Support vessels for project activities are described in Section 2.6.4.2 and considers ranges of vessels likely to be on site, depending on the nature of activities and project phasing. Effects of project vessels are assessed for each VC in Chapters 9 through 14 and includes intra-project effects. Updates to the EIS are not required.

<table>
<tr><td>IR-9
CEAA-4</td><td>Guideline Ref: Part 2, Section 2.2, Section 2.4, Section 7.4</td><td>EIS Ref: Sections 2.6.2, 2.7.1.4</td></tr>
<tr><td>Context/Rationale</td><td colspan="2">Sections 2.6.2 and 2.7.1.4 of the Bay du Nord Development Project Environmental Impact Statement (EIS) indicates that activities such as initial plant/field startup, scheduled preventative maintenance, and inspections and reservoir or well maintenance activities are not routine; however, they are listed as planned activities.

From the list of planned flare operations, they appear to be more frequent than routine flaring and have potentially adverse effects on air quality and birds.</td></tr>
<tr><td>Request
15-Apr-19</td><td colspan="2">Estimate the expected frequency and duration of flaring events for planned maintenance and inspection activities.

Describe how planned flaring could alter predicted air emissions and predicted effects on birds.</td></tr>
<tr><td>Equinor Response
15-Nov-19</td><td colspan="2">A. Section 2.7.1.4 of the EIS defines flaring events per the World Bank definitions. Routine flaring is defined as continuous flaring of produced gas. As stated throughout the EIS, there will be no routine flaring of produced gas; “all produced gas not used as fuel at the FPSO will be reinjected into the reservoir.” (Section 2.7.1.4).

As indicated in the EIS (Section 2.7.1.4) flaring will only occur during non-routine and safety events. Planned, non-routine flaring (per the World Bank definition, EIS s. 2.7.1.4) will occur during initial start-up of the facility and during shut-down and start-up activities related to planned maintenance turnarounds. Initial start-up is planned in 2025. Scheduled maintenance turnarounds involving facility shut-down typically are carried out every 3-5 years. Duration of these non-routine flaring events will typically be of short duration (few hours) and will be governed by Equinor best practices to reduce overall flaring duration before shut-down. A flaring and venting plan is required to be submitted to the C-NLOPB as part of the Operations Authorization (OA) process.

Flaring will otherwise only be carried out during un-planned upset/emergency/safety events. By the nature of such events, frequency and durations are difficult to estimate. Equinor’s best practices to limit the amount of flaring will also apply to these unplanned events.

The following clarification will be added to Section 2.7.1.4 of the EIS:

“No routine flaring of produced gas (i.e., continuous flaring of produced gas) will occur during normal operations.”

The following text will be added to Section 2.7.1.4:

“Planned, non-routine flaring will occur during initial start-up of the facility and during shut-down and start-up activities related to planned maintenance turnarounds. Initial start-up is planned in 2025. Scheduled maintenance turnarounds involving facility shut-down typically are carried out every 3-5 years. Duration of these non-routine flaring events will typically be of short duration and will be governed by Equinor best practices to reduce overall flaring duration before shut-down. A flaring and venting plan is required to be submitted to the C-NLOPB as part of the Operations Authorization (OA) process.”

B. Estimated flaring, which included planned non-routine and unplanned safety flaring events, was included in the predicted air emissions and modelled concentration predictions, as described in Chapter 8 of the EIS. In addition, the emission estimates</td></tr>
</table>

	and air quality modelling results presented in Chapter 8 and Appendix K of the EIS included multiple scenarios for accidental unplanned flaring. Air emission estimates were based on global Equinor data. The effects assessment of marine and migratory birds (Chapter 10) considered the effects of flaring. As stated in Section 10.2.2.2 of the EIS, the effects assessment was carried out with the assumptions that there will be no routine flaring, that non-routine flaring will occur during turnarounds / shut-downs for maintenance and depressurization of process segments for safety reasons, and that, in a worst-case scenario (bird perspective) a pilot flare (much smaller than non-routine flare) will be operating continuously. As stated in Section 10.2.2.2, “Regarding the environmental effects of the options for flare design, for the purposes of the EA, the worst-case would be a continuous pilot flare. Therefore, the effects assessment conclusion considers the worst-case scenario.” Planned, non-routine flaring will involve larger gas volumes than the pilot flare. However, such events are typically episodic and infrequent and do not represent the worst-case for the marine and migratory birds effects assessment. The predicted effects of flaring on marine and migratory birds based on a continuously lit pilot flare remain valid. Updates to the EIS are not required.

IR-10 **C-NLOPB-4**	**Guideline Ref:** Part 2, Section 2.2, Section 2.4, Section 7.4	**EIS Ref:** Section 2.6.2, Section 2.7.1.5
Context/Rationale	In Sections 2.6.2 and 2.7.1.5 in the Bay du Nord Development Project Environmental Impact Statement (EIS), Equinor ruled out reinjection of produced water into the reservoir for pressure maintenance and water flood due to it being technical and economically infeasible. Justification presented in the EIS is based on generic issues and not reservoir-specific fluid data to justify not proceeding with reinjection of produced water. Without specific knowledge of the reservoir (e.g. chemical and physical composition of the water), it is not clear how reinjection can be completely ruled out. Even if there are issues, for example with produced water reacting or otherwise interacting with other materials with which it comes into contact, the proponent has not explained why this cannot be dealt with by treating or conditioning the produced water prior to reinjection. Equinor also stated that it has ruled out reinjection of produced water because of the need to mix it with seawater, using the sole planned injection line. It is not clear whether or not Equinor considered installing a separate line for reinjection of produced water.	
Request **15-Apr-19**	Provide more detail on the technical and economic feasibility of produced water reinjection to understand the justification for eliminating the option of produced water reinjection. Discuss the feasibility of having a dedicated injection line for produced water, separate from the seawater line.	
Equinor Response **15-Nov-19**	It is of the opinion of Equinor Canada that the information provided regarding the assessment of alternatives for produced water management meets the requirements of Section 2.2 of EIS Guidelines. The discharge of treated produced water is considered the ‘worst-case’ scenario with respect to the environmental effects assessment for the BdN Project. As discussed at the Regulatory Review Workshop (May 2019), the type of information and technical assessment of produced water interaction within the reservoir	

	which is being requested by the C-NLOPB will be addressed in the Development Plan, which Equinor Canada is preparing. For clarity, the following text will be included in Section 2.7.1.5 ***"The assessment of alternatives for management of produced water will be further discussed in the Development Application for the BdN Development Project required under the Atlantic Accords Acts."***

IR-11 **CEAA-5**	**Guideline Ref:** Part 2, Sections 7.1.1 and 7.1.2	**EIS Ref:** Section 2.6.3.1; **Appendix D**
Context/Rationale	Section 2.6.3.1 and Appendix D in the Bay du Nord Development Project Environmental Impact Statement (EIS) indicate that the sound modeling from vessels only considers thruster vibration and sound for station keeping for the floating production, storage and offloading (FPSO) and a drillship; however, the project description refers to mooring for the FPSO. It is not clear how the FSPO is kept on location. This information is required to assess the applicability of the sound modeling for the FPSO. Thruster or propeller vibration or sounds from geophysical, support and supply vessels that maneuver around the FPSO or on standby, or conducting seismic surveys were not included in the EIS. Modeling for the 4D seismic survey shows a point source when in fact the seismic vessel will be transiting the entire production field and ensonifying a larger area. The full suite of sound and vibration-related sources needs to be considered in the effects assessment.	
Request **15-Apr-19**	A. Clarify the station keeping method for the floating production, storage and offloading (FPSO). B. Discuss the rationale for delineating the sizes of zones of influence on sound and vibration that is not inclusive of all project vessels (FPSO, MODUs, shuttle tankers, seismic, support and supply vessels) individually and in a cumulative manner during simultaneous operations; along transit routes for shuttle tankers and support / supply vessels; and for 4D seismic surveys over the production field. C. Update the assessment of noise-related effects considering these multiple sources.	
Equinor Response **15-Nov-19**	A. To clarify station keeping, the text in Section 2.5.3.1-Turret of the EIS will be amended to read as: "The turret will be designed to meet specific operational requirements in terms of ability to disconnect; provide support, connection and maintain integrity for risers, umbilicals and power cables; and rotation/position maintenance of the FPSO. ***The FPSO is connected to the mooring via 12 mooring lines from the turret. The turret is comprised of two connectable pieces, a buoy moored to the seabed and the turret structure which will be designed to meet specific operational requirements in terms of ability to disconnect; provide support, connection and maintain integrity for risers, umbilicals and power cables; and rotation/position maintenance of the FPSO. Depending on weather conditions, thrusters may be used to reduce tension of mooring lines, therefore thruster use will be intermittent throughout the year***."	

	B. As discussed in the Regulatory Workshop om 15-May-19, with Equinor Canada's sound modeler present via telephone, Equinor Canada Ltd. modelled sound emissions from various vessel and equipment sources that will be employed during the BdN Development. Sound modelling was not a requirement of the EIS Guidelines, therefore the scope of sound modelling was determined in consultation with Equinor in-house experts on sound and marine life, marine mammal and fish biologists from LGL and sound experts from JASCO Ltd, who performed the modelling. That assessment along with professional judgement were used to select a range of scenarios that would provide representative sound levels to inform the EIS process. For sound modelling of the FPSO and drillship, it considered full-time thruster operations, operating at 50% power. As an example, the 4D seismic survey array has by far the highest energy levels of all sources considered. When the array is present, the other sources, including the tow vessel's propulsion and the thrusters on the FPSO, do not contribute materially to the local received sound energy. Similarly, when the seismic array is distant, the local sounds from the FPSO will dominate the received sound energy. There will always be small areas where the sounds from multiple transient sources will be additive and could potentially double the received sound energy for short periods of time. However, it is likely that one of the sound sources will then move, their relative energy contributions will change and only one of the sources will determine the total daily sound levels that are compared to the Southall et al. (2019) criteria. Thus, modeling of each source individually is sufficient to determine a zone of influence and inform the EIS for its effects analysis. Conservatively, a 50 km zone of influence, which borders the entire Project Area, was used in the EIS to assess effects of sound emissions on marine mammals and fish. The ZOI is conservative in that it considers intra-project and cumulative effects from multiple sound sources, as described above. Sound modelling was not a requirement of the guidelines and the ZOI for the vessel traffic route was determined based on the professional experience and judgement of the EIS team. Vessel traffic is estimated to range from 4 to 16 vessels per month where activities overlap, therefore at most one per day. A 10 km ZOI was the same ZOI used in previous environmental assessment which was accepted by CEAA. There have been no specific areas along the shipping transit route to the Project Area that have been identified as marine mammal breeding grounds, feeding concentrations, and migration routes. Updates to the EIS are not required. C. Based on the information provided in Part B, the effects assessment is complete and amendments to the EIS are not required.

IR-12	**Guideline Ref:** Part 2, Section 3.1	**EIS Ref:** Section 2.6.3.2
DFO-38		
Context/Rationale	The possibility of batch drilling (multiple sections at the same time) and operation of multiple drill rigs is not assessed in the drill cuttings modelling scenarios. This information is required to fully assess environmental effects of all Project activities	

Request **15-Apr-19**	Provide details regarding potential of batch drilling and operating multiple drill rigs on cuttings dispersal and zone of impact.
Equinor Response **15-Nov-19**	Batch drilling is considered in Appendix I "Drill Cuttings Dispersion Modelling Bay du Nord Development Project" (Wood 2018) with the drilling of eight wells from a single template, see Section 3.1, Table 3.5 of Appendix I. The modelling included the drilling of the upper two sections of each well drilled in sequence, which is consistent with batch drilling as described in Section 2.6.3.2. If multiple drilling installations were operating simultaneously, they would be located at different template locations. Cuttings dispersion modelling is based on a single template location. Therefore, the results of modelling in a single template location is representative of other template locations, whether drilled simultaneously or consecutively. The predicted zone of influence (i.e., approximately 200 m) would be the same for each template location. Given the distance between template locations, overlap between discharge locations between templates is not predicted. Effects from drilling discharges for all well template locations are addressed in Section 9.2.3.2 of the EIS. While it was indicated at the Regulatory Review Workshop (May 2019) that the EIS would be amended to provide clarity on batch drilling, based on further review of the information in the EIS, Equinor Canada is of the opinion that the EIS and Appendix I provide sufficient information regarding batch drilling.

IR-13 **CEAA-6** **DFO-1**	**Guideline Ref:** Part 1Section 3.2.1 Part 2 Section 7.1.2, Section 7.3.1	**EIS Ref:** Section 2.6.3.3, Section 2.8.2, Table 2.21, Section 9.2.2.2, Section 9.2.4.1, Section 9.2.4.2
Context/Rationale	Section 2.6.3.3 of the EIS did not provide chemical components of well workover fluid and well treatment fluids that will be discharged to the marine environment. Table 2.21 lists estimated discharges of effluents; however, it does not include sewage and food waste discharge volumes for the MODUs. Also oil from produced water, type of glycol, well intervention fluids and fire control water and their estimated volume are not completely described in Table 2.21. This organic waste may affect fish and fish habitat, and the presence of multiple sources could expand the zone of influence and cumulative volume entering the water. Section 2.8.2 and Table 2.21 in the EIS provides estimates of volumes of discharges for the Project, but does not seem to include discharges from potential future development. Estimates from potential future development should also be provided to evaluate worst case. Although the Offshore Waste Treatment Guidelines set limits of some effluents, and chemical selection process evaluates the lowest toxic chemical, neither mitigation eliminates the introduction of a mix of chemicals that may be additive or synergistic in behavior once in the marine environment. The variety, volume, location and timing of chemicals discharged to the marine environment needs to be considered to assess potential individual, additive or synergistic effects that may change water quality. This information is required to assess the potential cumulative environmental effects of the Project. Section 9.2.2.2 in the EIS includes modeling individual chemicals of concern with produced water mixed with cooling water scenarios, but only chemicals in produced water	

	are evaluated. Certain cooling water chemicals appear not to be taken into consideration (e.g. unidentified biocides). The discharge of produced water comingling with sewage (grey and black water) discharges may result in cumulative water quality effects that have not been considered. Degradation of organic waste and oil from produced water may result in biochemical oxygen demand in the vicinity of the platform. Adsorption of chemicals to organic matter from sewage may change the fate of those chemicals and potentially increase exposure of marine animals (through ingestion) in the water column and at the seafloor, and alter sediment chemical characteristics. In Section 9.2.2.2 of the EIS only discusses effects of thermal characteristics of the cooling water. The effects of the cooling water is considered to be localized, but the effects are not described nor is the term “localized” defined.
Request 10-Jun-19	A. Provide information on the typical chemical constituents, volume, discharge location and timing of well workover and well treatment fluids, glycol, oil within produced water, well intervention fluids and fire control water to inform an assessment of changes in water quality. B. Describe the zones of influence and assess the potential effects of these liquid wastes on marine biota and water quality (habitat). C. Discuss the fate and effect of dissolved and suspended solids that are above natural variability. D. Provide an effects analysis of comingling waste discharges from the production facility. E. Define the extent of “localized effect” of cooling water, describe the effect, and describe how that area was determined. F. Describe the localized effects on habitat (water column, infrastructure, and FPSO hull) and biota from thermal discharges. G. Evaluate the chemical constituents (biocides) of cooling water discharged into the sea and describe effects on water quality (habitat) and biota. H. Update Table 2.21 and associated text to include estimated quantities and locations (or indicate range of locations if not fixed or yet known) of Project effluents from all sources and assess the total effect of this discharge on birds, fish and fish habitat. I. Update Table 2.21 to include potential future development or justify why such discharges were not included.
Equinor Response 15-Nov-19	A. As stated in the EIS, all discharges will be in accordance with regulatory requirements and the OWTG. The discharge limits set out in the guidelines are based on an in-depth review of international studies and scientific literature regarding overall effects and are developed based on input and review of subject matter experts, all with the goal to minimizing the effects of waste discharges in the marine environment. As stated in Section 2.7.5, the Project is in the early stages of project design and information regarding volumes of wastes to be discharged and chemicals required for production and / or drilling activities are yet to be determined. Estimates of volumes of waste discharges, including well completion fluids, are provided in Table 2.21. Estimated volumes of chemicals that could be used during hook-up and commissioning are provided for in Section 2.6.1.4. As also stated in Section 2.7.5, all

	chemicals that may be discharged will be screened in accordance with C-NLOPB guidance, with the goal of choosing chemicals that once discharged a sea would have the least effect on the environment. Well interventions and/or work-overs are only performed to resolve issues in the well-bore and are not pre-planned. The timing and number of these type of activities cannot be determined. Fluids to be discharged during well workover and interventions (including well treatment) are typically water based hydraulic fluids consisting of a water/glycol (MEG) mixture. Depending on the type of intervention/work-over required, fluids may be discharged to the environment, put into the reservoir or shipped to shore. As stated below in Part H, in accordance with Section 3.2 of the EIS Guidelines, the effects assessment of project activities was based on those discharges/activities "which have the greatest potential to have environmental effects" (i.e., produced water). Volumes of well intervention fluids, if discharged would be much lower in comparison to larger volumes wastes such as produced water. Furthermore, as stated above and described in Section 2.7.5, all chemicals that may be discharged will be screened in accordance with C-NLOPB guidance, with the goal of choosing chemicals that once discharged a sea would have the least effect on the environment. As stated in the EIS, produced water will be treated to meet the minimum OWTG limit of 30 mg/l. The assessment of effects associated with residual oil in produced water is provided for in the applicable VC chapters. Sewage and food waste discharge listed in Table 2.21 is provided for the largest source in Table 2.21 (FPSO, with the highest possible POB = 110). A MODU is not chosen for the Project therefore discharges volumes are unknown. Description of the zones of influence and potential effects, including intra-project effects, are described in Chapters 9 through 12. B. See response to Part E, below. C. The discharge of liquid wastes is described in Section 9.2.2.2. Any areas of dissolved and suspended solids above natural variability would be at the source prior to being rapidly dispersed and diluted with discharge. As noted, the spatial extent of wastes would be localized. Liquid wastes are treated and managed in accordance with the OWTG (NEB et al. 2010). D. The co-mingling of wastes for the BdN Project, based on preliminary design, is only considered for the produced water and cooling water waste streams. The reviewer is incorrect in stating that sewage discharges will be co-mingled with the produced water stream. The EIS considers the effects of discharging each of these waste streams separately (refer to Section 9.2.2.2 for Fish and Fish Habitat). The effects assessment of produced water includes the effects of residual oil and other contaminants in treated produced water, effects of discharging high temperature water, and discharging water with higher salinity. For cooling water, the effects assessment considers the effects associated with discharging this waste stream at higher temperatures and at a higher salinity than the receiving marine environment, as well as potential effects of entrainment of species during intake of seawater. Each component is assessed separately. However, as the produced water modelling shows, there is no significant change to the plume with the co-mingling of the waste streams. An environmental assessment of the co-mingled stream is not required. E. "Localized" is defined as within the immediate vicinity of the activity (refer to Chapter 4, Table 4.5 of the EIS) and is a widely accepted term used in environmental

	assessment. In terms produced water discharge modeling results show the plume extending, within approximately 100 m, therefore a localized area. F. The effects of cooling water (e.g., a thermal effluent) on marine fish and fish habitat were described in Section 9.2.2.2. As described in Section 9.2.2.2, potential effects may include “entrainment of marine organisms in the water column including passively drifting plankton, algae, eggs and larvae” and “mortality or injury to marine organisms in the water column due to exposure to extreme environmental parameters” from elevated salinity and temperature. G. As stated above in Part A, choice of chemicals for use during drilling and production is not yet known as the Project is at the early design stages. Chemicals chosen will be in accordance with established chemical screening protocols in accordance with the C-NLOPB guidance. Section 9.2.1 and 9.2.2 include biocides in the effects assessment. H. All primary liquid discharges associated with the Project are listed in Table 2.21, with appropriate cross-referencing to sections in the EIS where additional information can be found. Fire control water is seawater and therefore not included in the table. As stated in the EIS, the Project is in the early stages of design and waste discharge locations are not known. For modelling purposes and based on existing FPSO operating in the Equinor portfolio, it was assumed that produced water would be discharged at approximately 20 m below sea level. Discharge locations, with respect to water depth for drill cuttings is provided in Section 2.8.2.2. Locations for other discharges are not available. In accordance with Part 2, Section 3.2 of the EIS Guidelines, the effects assessment of project activities was based on those discharges/activities “with the greatest potential to have environmental effects.” As such, detailed environmental assessment of waste streams discharged to marine environment, which are common across many marine based industries, including sewage, grey water, bilge and ballast water, and others, were not considered specifically in the effects assessment. For instance, produced water, one the largest sources of discharges to the marine environment, with a residual oil-in-water content of 30 mg/l was considered one of the worst-case discharges for the effects assessment. Bilge/ballast water, other hydrocarbons that may be discharged as a result of activities (e.g., hydraulic fluid, discharges from drains,) would include volumes and oil-in-water concentrations as much lower amounts. Furthermore, the OWTG states “waste material discharged at the concentrations and in the manner specified in these guidelines is not expected to cause significant adverse environmental effects in areas where offshore petroleum activities are anticipated to occur” (NEB et al. 2010). Therefore, the effects assessment of discharges is considered conservative as it considers worst-case discharges. The effects of discharges on the VCs is provided for in Chapters 9-14 of the EIS. I. As defined in Section 2.1, the Project, as is referenced in the Table title “Estimate of Volumes of Discharges for the Project”, includes the Core BdN Development and Potential Future Development. Hence all wastes listed in Table 2.21 are for the Core Bdn Development and Potential Future Development. For clarity, the EIS will be amended to include the following text:

	"Table 2.21 provides an overview of estimated liquid wastes associated with the Project, ***which includes the Core BdN and Potential Future Development***, including the FPSO, subsea system, drilling installation and vessels."

IR-14 **CEAA-7**	**Guideline Ref:** Part 1, Section 3.1	**EIS Ref:** Section 2.6.4.2
Context/Rationale	Section 2.6.4.2 of the EIS provides information on the existing annual transit of offshore vessels associated with offshore oil and gas activities (653 to 1027), but no annual estimates of project related transits are provided to substantiate the proponent's conclusion that there will be no significant increase to the total annual transits to and from St. John's Harbour. Also the shuttle tanker traffic route was described as going directly to foreign ports and / or to an unidentified NL transshipment terminal. The Newfoundland and Labrador transshipment terminal and shuttle tanker transit route were unidentified. This information is required to assess the potential environmental effects of the Project.	
Request **15-Apr-19**	A. Explain the conclusion that there will be no significant increase of annual transits to and from St. John's Harbour without providing the annual estimates of project related vessel transits for comparison. B. Update the EIS study area map and information on the shuttle tanker route between the FPSO and the transshipment terminal which is a different route than the support vessels and revise the effects analysis accordingly.	
Equinor Response **15-Nov-19**	A. Estimated monthly vessel transits per activity are described in Section 2.6.4.2 and Table 2.8. As some activities are seasonal, providing annual estimates would be misleading. As stated in Section 2.6.4.2, there were, at a maximum, 1,601 annual transits in and out of the Port of St. John's over an eight-year period. Based on the numbers presented in Table 2.8, using the potential maximum number of transits between ongoing production activities and peak transits during drilling and production which range from 8 to 16 maximum transits per month, the annual estimate would be 96 to 192 (multiply monthly transits by 12), representing between five to 10 percent increase in traffic. These estimates are conservative as it assumes that the maximum number of vessels would be engaged when drilling and production are occurring simultaneously. Such an increase in traffic would be temporary as current estimates for drilling activities are three to five years in duration. Updates to the EIS are not required. B. Information on shuttle tanker traffic routes is provided in EIS Section 2.6.4.4 and Section. 7.2.2. Existing marine shipping lanes and transit routes are depicted in Figure 7-45. The text in Section 2.1 of the EIS will be amended to read as: "The Project is located approximately 500 km offshore from St. John's, Newfoundland and Labrador (NL). Crude oil will be offloaded from the production installation to shuttle tankers. Production operations offshore NL utilize the Basin Wide Terminal and Transshipment System (BWTTS), which is a fleet of modern shuttle tankers that ships crude to an existing transshipment terminal in NL or direct to market. ***The only transshipment terminal operating in Newfoundland is the Newfoundland Transshipment Terminal, located in Placentia Bay."***	

	Per Section 3.1 of the EIS Guidelines, the scope of the designated project includes: "Crude oil shipping including movement, hook-up/disconnect and offloading of crude to shuttle tankers within the Project safety zone." Shuttle tanker activities outside the Project safety zone are not included in the definition of the designated project in GL s. 3.1. Effects of shuttle tanker activities within the Project safety zone are primarily related to accidental events and are discussed in Chapter 16 under batch spills for each respective VC. Additional updates to the EIS are not required. While it was indicated at the Regulatory Review Workshop (May 2019) that the EIS would be amended to provide clarity in the EIS, based on further review of the information in the EIS, Equinor Canada is of the opinion that the EIS is complete and further updates are not required.

IR-15 **CEAA-8**	**Guideline Ref:** Part 2, Section 3.1; Section 7.3.8.1	**EIS Ref:** Section 2.6.4.3
Context/Rationale	Section 2.6.4.3 of the EIS states that there were a total of 2,123 helicopter flights in 2017 in support of offshore oil and gas operations. Weekly helicopter flights are provided in various stages of project development, but no annual estimates were provided. This information is required to estimate direct greenhouse gas and criteria air contaminant emissions and sound emissions associated with helicopter transportation as well as any mitigation measures proposed to minimize greenhouse gas and sound emissions	
Request **15-Apr-19**	Compare the project's flight frequency to existing flight frequency to quantify increases in helicopter flights on an annual basis and assess effects of atmospheric and sound emissions from the Project and the cumulative effects	
Equinor Response **15-Nov-19**	The Guidelines do not require the proponent to predict either the annual number of Project-related helicopter flights or the percentage increase represented by those flights over current total annual flight frequencies. The weekly frequency of Project-related helicopter flights is discussed in Section 2.6.4.3 by reference to each Project phase. However, annual frequencies would apply only to normal production operations and drilling, as all other activities are likely to be seasonal or short-term. The annual frequency for normal operations and/or drilling may be calculated by multiplying these figures by 52 (e.g., routine production of 5 trips per week would equate to 260 per year; at peak when drilling and production occur, 15 trips per week would be 780 per year). Given the annual variability in Project related helicopter flights, it is neither feasible nor useful to calculate percentage increases. Weekly estimates were used rather than annual estimates as some project activities are not carried out year-long. The effects (both Project-specific and cumulative) of atmospheric and sound emissions produced by helicopters have been assessed in the EIS, as applicable, based upon these predicted weekly maximums. Potential interactions between helicopters-associated sound and Marine and Migratory Birds and Marine Mammals and Sea Turtles and appropriate mitigation measures are identified and discussed in Chapters 10 and 11 respectively with further clarification provided in response to IR-27. No interaction between helicopters sound and fish or fish habitat was identified (See Chapter 9). While air quality is not a separate VC for assessment purposes, Project emissions from both routine operations and accidental events have been modelled (see Appendix K) and the results of such modelling are thoroughly discussed in Chapter 8 (Air Quality), including the Project's contribution to cumulative air quality effects (see Section 8.5.4 and Table 15.1). The	

	cumulative effects of Project-related helicopter sound in conjunction with sounds produced by other activities in the RSA are discussed in Chapter 15. Updates to the EIS are not required.

IR-16 **Con CEAA-10**	**Guideline Ref:** Part 2, Section 3.2.5	**EIS Ref:** Section 2.6.4.4
Context/Rationale	Non-conformity with Section 3.2.5 of the EIS Guidelines on providing information on fuel transfer management of shuttle tanker operations.	
Request **15-Apr-19**	As required in the EIS Guidelines, provide the description of fuel transfer management for the shuttle tanker. This operation presents a significant potential for spills and this information is important to assess care and control of project components.	
Equinor Response **15-Nov-19**	The EIS is fully conformant with s. 3.2.5 of the EIS Guidelines regarding fuel transfer management for the shuttle tanker. Section 3.2.5 of the EIS Guidelines requires the proponent to provide information on “oil transfer procedures, rates and durations, and measure to manage fuel transfers”. Equinor Canada Ltd. interpreted that “oil transfer procedures” refers to the offloading of crude from the FPSO to a shuttle tanker and “measures to manage fuel transfer'' refers to the bunkering of diesel to the shuttle tanker. Information regarding offloading and shuttle tanker operations are described in EIS Sections. 2.5.3.1 and 2.6.4.4. As stated in that section “Bunkering of fuel required for the shuttle tankers will not occur in the Project Area.” As indicated in the EIS, the Project is in the early design phase. Procedures, such as crude offloading, will be developed once project design is completed as the procedures will need to consider design aspects of the offloading and storage systems. The procedures will be submitted as part of the documentation required under the C-NLOPB OA process. The procedure will need to consider these design requirements in combination with workable sea state conditions, weather, wave heights, etc. Equinor Canada, in developing the procedure will incorporate best practices and operational experiences from its existing FPSO operations and those of its partner-operated facilities offshore NL. The probability of a batch spill during offloading occurring is provided in Section 16.3.5. Spill trajectory modelling of these batch spills are in Section 16.4.4, and Section 16.7 provide an effects assessment of batch spills on each of the VCs. The information in the EIS is complete and amendments are not required.	

IR-17 **C-NLOPB-5**	**Guideline Ref:** Part 2, Section 3.2.6	**EIS Ref:** Section 2.6.5
Context/Rationale	In Section 2.6.5 in the EIS, Equinor states, “Conventional seismic surveys could be between two and four weeks and…” This survey duration appears to be too short to collect sufficient data.	
Request **15-Apr-19**	Describe the potential reservoir area of surveying (based on the significant discovery licence or production licence areas) and estimated line shot efforts to verify that this type of survey realistically can be accomplished in such a short time frame.	

Equinor Response 15-Nov-19	As indicated in the EIS, the project is in the early design stages and the information regarding line shot efforts, are not known at this time. The Core BdN Development Area is approximately 470 km^2, and includes SDL 1055, SDL 1056 and SDL 1057 held by Equinor Canada. For the Core BdN Development, as defined in Chapter 2, 4D seismic surveys will be carried out within the Core BdN Development area, which is a smaller area than the area covered by conventional 3D seismic surveys offshore NL. Therefore, it is the opinion of Equinor Canada, that a 4D seismic survey within the Core BdN Development Area can be carried out within the estimated two- to four-week timeframe. For the purposes of environmental assessment, it is assumed that seismic acquisition will occur over this timeframe.

IR-18 **ECCC-5**	**Guideline Ref:** (iv) any other component of the environment that is set out in Schedule 2	**EIS Ref:** Section 2.7.1.2; Section 8.4
Context/Rationale	In Section 2.7.1.2 in the EIS, Equinor proposed that the power generation equipment will meet Tier III emission standards, and use high efficiency equipment. “There are two different power generation solutions under consideration for the Floating Platform Storage and Off-loading (FPSO). • One option is based on eight dual fuel reciprocating engines located in the FPSO hull. Each engine would have 7 megawatts (MW) of power for total installed power of 56 MW. The peak load during operations is estimated to be 43 MW, while power consumption during normal operations will be in the range of 24 MW to 36 MW. • Second option is an alternative power solution based on using gas turbine generation. This option involves one 50 MW to 60 MW gas turbine located on the FPSO topside. The rated power output for this type of turbine is 52 MW and supplies the same power as above. Gas turbines are the most common type of power generation in the oil and gas industry. • Both alternatives are dual fuel solutions (i.e. capable of running on natural gas and diesel fuel). In normal operations gas fuel is assumed for both alternatives.” Section 7.3.8.1 of the EIS guidelines (Air Quality and greenhouse gas emissions), required the proponent to: • “Provide a description of all methods and practices (e.g. control equipment) that will be implemented to minimize and control atmospheric emissions throughout the project life cycle, as well as the assumed performance of the emission control approaches (i.e. leak detection method and frequency, flare efficiency, maintenance practices). If the best available technologies are not included in the project design, the proponent will need to provide a rationale for the technologies selected;” • “Provide an estimate of the direct greenhouse gas and criteria air contaminant emissions associated with all phases of the project (i.e. including drilling, flaring, production, and marine and helicopter transportation) as well as any mitigation measures proposed to minimize greenhouse gas emissions. This information is to be presented by individual pollutant and should also be summarized in CO2 equivalent per year. The proponent will use the global warming potential that is currently used for national and provincial reporting purposes. …” • “ … provide information on the fuel type and the estimated amount of fuel consumed for power generation;	

	• "… provide information related to the project's electrical demand and sources of electrical power for equipment (i.e. the project's main source and any other additional sources (generators, etc.), as appropriate), as well as how emission estimates were calculated."
Request 15-Apr-19	A. Confirm that the equipment will meet Tier III emission standards by providing further power plant details on both Option 1 and Option 2 (e.g. engine models and installed controlled equipment if any). B. Quantitatively confirm the estimated direct GHG emissions being emitted from the designated project during all phases of the project by providing the estimated amount of fuel consumed for power generation (diesel and gas) and information regarding the Project's estimated electrical demand.
Equinor Response 15-Nov-19	A. As stated in the EIS and at the Regulatory Review Workshop (May 2019), the Project is in the early design stage. The information requested by the reviewer is not available. As indicated at the Regulatory Review Workshop, Equinor Canada will update ECCC regarding emission estimates and equipment, once selection is complete. B. GHG emissions are provided in Chapter 8 of the EIS, based on preliminary project design. As stated in response to Part A, Equinor Canada will update ECCC regarding emission estimates and equipment, once selection is complete To clarify, the following text will be included in Section 8.1 of the EIS. ***"As Project design is ongoing, the emission estimates provided herein are based on preliminary design. Once design is complete and power generation equipment has been selected, Equinor Canada will provide updated emissions estimates to the C-NLOPB and ECCC."***

IR-19	**Guideline Ref:** Part 1, Section 7.3.8.1	**EIS Ref:** Section 2.7.1.4
ECCC-6		
Context/Rationale	In Section 2.7.1.4 in the EIS, only generic terms are used in the description of flare gas recovery mitigation, given that this is being considered and has not been finalized as a design parameter ("FPSO topside facilities will be designed to minimize hydrocarbon release from flaring during normal operations"*).* This lack of decisive specification does not readily allow for quantitative evaluation of greenhouse gas emissions.	
Request 15-Apr-19	Provide specific examples of hydrocarbon release minimization at the FPSO. For example, add information on the expected combustion efficiency for flaring at the facility. Identify emissions calculations, the range of options and include a description of emission factors, activity base, assumptions and calculations.	
Equinor Response 15-Nov-19	See response to IR-9/CEAA-4. Chapter 8 provides information regarding emission calculations, emissions from alternative power options under consideration, and assumptions. As stated in response to IR-18/ECCC-5, Equinor Canada will provide updated emissions information to ECCC when design is complete.	

IR-20 **DFO-26**	**Guideline Ref:** Part 2, Section 2	**EIS Ref:** Section 2.7.1.5
Context/Rationale	Section 2.2 of the EIS Guidelines requires an alternative means analysis for disposal of produced water. Injection modelling simulations were described in Section 2.7.1.5, but not referenced.	
Request **15-Apr-19**	Provide reference(s) for injection modelling simulations.	
Equinor Response **15-Nov-19**	The description of the injection modelling simulations included in section 2.7.1.5 is sufficient for identifying and considering the environmental effects of alternative means of disposing produced water. Injection modelling simulations are internal company modelling simulations undertaken by Equinor Canada and are proprietary and confidential to Equinor.	

IR-21 **ECCC-8**	**Guideline Ref:** Part 2, Section 2.2	**EIS Ref:** Section 2.7.1.7
Context/Rationale	Section 2.7.1.7 of the EIS stated "Nevertheless, within the limitations given, measures to reduce the attraction of seabirds are being investigated and include reducing/turning off major light sources for short periods, and installation of directional/shielded lighting. Multiple sets of lighting with varying intensity with a fail safe or motion-sensor-based return to maximum lighting may be considered". All investigations of measures to reduce attraction of seabirds to offshore activities should be conducted with scientific rigor. Prior to the investigation of a new mitigation measure, baseline levels of attractiveness should be measured and compared to level of attractiveness after the new measure is implemented.	
Request **15-Apr-19**	Within Equinor's investigation for lighting alternatives include a quantification of the variance in bird strandings/behaviour in response to different lighting arrangements on the platform in order to determine the effectiveness of a particular measure at mitigating the effects of light attraction on migratory birds.	
Equinor Response **15-Nov-19**	Equinor Canada is aware of the concern regarding the potential attraction of birds to offshore installations due to new lighting. Based on our investigation into alternative lighting arrangements to reduce potential bird attraction to the FPSO, Equinor Canada is unaware of any quantitative information on the baseline attractiveness of offshore installations. However, in response to this concern, Equinor Canada is investigating possible technical solutions to reduce external lighting of the FPSO. Per Part 1, Section 3.2 of the EIS guidelines, the review of alternative lighting will focus on their economic and technical feasibility. Section 2.2 of the EIS Guidelines specifies that the following alternative is to be taken into consideration *"alternative ways to light the platform at night to reduce attraction and associated mortality of birds",* and this was achieved in Section 2.7.1.7 of the EIS. Measures to reduce or mitigate the potential attraction of marine and migratory birds to light are being evaluated. Based on the outcome of this analysis, it will be determined what options are technically and economically feasible to implement for the FPSO. Equinor Canada, as stated during the Regulatory Review Workshop (May 2019), will provide information and engage with ECCC regarding lighting design, once lighting design options are available.	

	For clarity, the following text will be added to Section 2.7.1.7 of the EIS: ***"Equinor Canada will engage ECCC regarding lighting design when additional information and options for lighting design are available, as the design progresses."***

IR-22 **DFO-39**	**Guideline Ref:** Part 2, Section 3.1	**EIS Ref:** Section 2.7.1.8
Context/Rationale	Reference is made to *"produced sand"*, but such discharge is not assessed. All Project discharges and wastes need to be identified to assess environmental effects of Project activities.	
Request **15-Apr-19**	Describe discharge process, potential footprint, and potential environmental effect of produced sand.	
Equinor Response **15-Nov-19**	Based on ongoing project design, it is not anticipated that sand will enter the wellbore and thus require processing and disposal. Based on early design, should produce sand be encountered, it is estimated that volumes of produced sand will be minimal. It is Equinor Canada's preference to ship produced sand to shore for disposal in an appropriate waste management facility, with the option of discharging treated produced sand overboard. As stated in responses to IR-13(h) and IR-218, in accordance with Section 3.2 of the EIS Guidelines, the effects assessment of project activities was based on those discharges/activities "with the greatest potential to have environmental effects." Based on Project design, as stated above, should produced sand be discharged overboard, it would be of minimal volume, treated in accordance with the OWTG, and not one of the waste streams with greatest potential to cause environmental effects. Updates to the EIS are not required.	

IR-23 **ECCC-9**	**Guideline Ref:** Part 2, Section 2.2	**EIS Ref:** Section 2.7.4.4
Context/Rationale	Section 2.7.4.4 in the EIS suggests that synthetic based mud (SBM) typically has a longer usable shelf life than water based mud (WBM) and the potential for reuse of SBM is much greater than WBM. This would ultimately result in less environmental effects for drilling fluid disposal; either at site in the case of WBM, or at a shore based waste management facility for SBM. The fact that SBM is reusable may result in less volume for disposal, but that does not necessarily correlate to resulting in less environmental effects. The disposal of smaller quantities of a more toxic substance may in fact result in more environmental effects.	
Request **15-Apr-19**	Provide empirical analysis to support the statement in Section 2.7.4.4 "This would ultimately result in less environmental effects for drilling fluid disposal".	
Equinor Response **15-Nov-19**	For clarity, the sentence "This would ultimately result in less environmental effects for drilling fluid disposal", will be deleted. However, EIS Section 9.2.3.2 – Synthetic Based Muds provides information on the toxicity of SBM.	

IR-24 **ECCC-11**	**Guideline Ref:** Part 2, Section 7.3.8.1	**EIS Ref:** Section 2.8.1
Context/Rationale	Section 2.8.1 of the EIS is not clear in what the expected production was estimated to be during normal operations. Production data will impact emissions estimates as well as emission intensity calculations.	
Request **15-Apr-19**	Clarify the expected production rates for normal operations on the FPSO, for varying stages of the projects life (early, mid, late). Provide the methodology used to determine the emission intensity of the project. If these are significantly different from the two existing FPSO facilities for which emissions and production data is publicly available, justify the assumptions for these differences.	
Equinor Response **15-Nov-19**	As described in the EIS and as indicated during the Regulatory Review Workshop (May 2015), the Project is in the early stages of design. Emissions information provided in the EIS is based on global Equinor data and provides a best estimate of expected emissions, based on preliminary design. As indicated in response to IR-18/ECCC-5 Equinor Canada will provide updated emissions estimates to ECCC, once design is complete.	

IR-25 **C-NLOPB-6**	**Guideline Ref:** Part 2, Section 2.4, Section 7.4	**EIS Ref:** Section 2.8.2.2
Context/Rationale	Section 2.8.2.2 of the EIS does not describe how BOP fluid discharges would be reduced, despite the fact that there are technically-feasible means to achieve this, such as via return lines on the BOP. This information is needed to assess effectiveness of alternative means to mitigate Project effluents.	
Request **15-Apr-19**	Describe and discuss means to reduce the discharge of BOP fluid to assess effectiveness of alternative means to mitigate Project effluents.	
Equinor Response **15-Nov-19**	As indicated in the EIS, the Project is in the early stages of design. A drilling installation has yet to be contracted and as such, the type of BOP system is unknown at this stage. Globally, Equinor does not have experience using a closed-loop hydraulic system on BOP systems in deep water. Operationally, there is uncertainty whether such a system would be functional in the approximate 1100 m water depths of the Project location, which may lead to operational constraints. As stated in the EIS, hydraulic fluids to be used in BOPs would be screened under Equinor Canada's Chemical Management System, with the goal of choosing chemicals that have the least effect on the receiving environment. Hydraulic fluid will be included in the EPP for the Project, which will be submitted to the C-NLOPB as required under the OA application process.	

IR-26 **CEAA-12**	**Guideline Ref:** Part 1, Section 3.1, Part 2 Section 7.1.1	**EIS Ref:** Section 2.8.3
Context/Rationale	Section 3.1 of the EIS Guidelines requires the proponent to describe sources and extent of heat and light. Section 2.8.3 of the EIS discusses heat sources but omits description of heat from flaring, produced water, and discharged cooling water. This information is needed to assess all Project effluents and their potential effects on the marine environment.	

	Section 7.1.1 of the EIS Guidelines requires the proponent to provide ambient night-time light levels at the project site, including night-time illumination levels during different weather conditions and seasons, this was not provided in the EIS. Multiple lights sources from the FPSO, two MODUs and several support vessels at various locations in the Project Area will increase the total amount of light and the extent of the zone of influence of lighting. This information is needed to assess changes in light levels between ambient conditions and Project activities.
Request 15-Apr-19	A. Provide information on anticipated heat emissions from flaring produced water and discharges and assess their potential zones of influence on ambient temperatures, and update the effects analysis on predicting changes to habitats. B. Quantify light emissions by project phase from all vessels and MODUs for evaluation of cumulative zones of influence between various sources at various locations in the Project Area. C. Update the effects analysis to compare ambient light levels with those levels emitted from the Project with emphasis on the specific marine biota most affected by change in natural light level (diel vertical migration, night feeding, etc.).
Equinor Response 15-Nov-19	A. As stated in the Section 2.7.1.5 of the EIS, treated produced water will be discharged into the marine environment; there will be no flaring of produced water on the FPSO. In addition, as stated in the EIS, there be no routine flaring. Effects of flaring on Marine and Migratory Birds (MMB) is assessed in Section 10.2.2.2 of the EIS. Potential thermal effects associated with waste discharges is addressed in Section 9.2.2.2 of the EIS and clarified in response to IR-278/ECCC-47;CEAA-108. Section 2.8.3 of the EIS provides information on heat sources associated with the Project. The available information regarding the effects of heat from flaring on Marine and Migratory Birds, which is included in Section 10.2.2.2 of the EIS, suggests that the size of the ZOI of the gas flare's heat would be a small fraction of that for the combined light emissions of platform electrical lighting and flare. The relative commonness of reports of nocturnal circulation of birds around flares and electric lighting in contrast with the rarity of reports of direct mortality from flares (Bourne 1979; Russell 2005) suggests that the magnitude of the effects of light attraction to a platform, i.e., energy consumption diverted from foraging and migration and of potential for mortality from stranding and collisions, is many times greater than the potential mortality from the heat of the flare. For clarity, the text in EIS in Section 10.2.2.2 will be amended to read as: "Such monitoring has not been conducted in the Gulf of Mexico, but ***only*** two burned songbirds out ***of almost 120,000 birds of 279 species*** were found in a ***multi-year*** study of the use of ***several*** offshore oil platforms as habitat by landbird passage migrants (Russell 2005) … At least one similar incident has been reported with offshore flares in the North Sea, where a large number ("hundreds to thousands") of passerines were observed to have been killed in a night by flares (although not by incineration) (Sage 1979); however, research by Bourne (1979) and Hope Jones (1980) suggests a much lower mortality rate in the North Sea of approximately a few hundred birds per year per platform. ***The relative commonness of reports of nocturnal circulation of birds around flares and electric lighting in contrast with the rarity of reports of direct mortality from flares (Bourne 1979; Russell 2005) suggests that the magnitude of the effects***

	of light attraction to a platform, i.e., energy consumption diverted from foraging and migration and of potential for mortality from stranding and collisions, is many times greater than the potential mortality from the heat of the flare. While accurate assessment of mortality at offshore facilities may be difficult, no mass mortality events have ever been reported at offshore oil and gas operations in offshore NL." B. As stated throughout the EIS, the project is in the early stages of design. Light levels from the FPSO, support vessels or drilling installation cannot be determined at this stage in project design. Effects of lighting on MMB were assessed in the EIS (s. 10.2.2.1). As described (EIS s. 10. 2.2.1) estimated zones of influence, based on scientific literature indicate that the ZOI is approximately 16 km. As discussed during the Regulatory review workshop in May 2019, the 16 km ZOI is applied around the broader Project Area to provide a conservative inter-project effects assessment and cumulative effects assessment of all lighting sources from all phases of the Project in combination with other activities that may occur within the Project Area. Updates to the EIS are not required. C. The effects of artificial lighting on marine fish and fish habitat is assessed in Section 9.2.2.1 of the EIS. For clarity the following information will be included in Section 9.2.2.1 regarding potential zone of influence of lighting effects on the water column. "The combination of FPSO colonization opportunities and artificial light emissions from the operating decks and navigation may create a "reef effect" in which fish may aggregate underneath in response to increased foraging and shelter opportunities (Picken and McIntyre 1989; Røstad et al. 2006; Slabbekoorn et al. 2010; Reynolds et al. 2018), even in areas of elevated underwater sound. ***Keenan et al. (2007) examined the light field from two active platforms in the Gulf of Mexico on fish communities out to 250 m and up to 20 m depth from the platform. Lighting was generally concentrated around the structure and showed localized influence from the artificial lighting. Lighting from the platforms were detected at greater than100 m away from the source, primarily near the surface (0.75 m depth) (Keenan et al. 2007). Light was detected from a platform with a flare at approximately 200 m from the source. The zone of influence was less than 1.5 km from the platforms as control stations for open water measurements were located approximately 1.5 m from the platform (Keenan et al. 2007). Light decreased with increasing depth as areas of background light level were reached in the sampling area (250 m from source) below 5 m and 10 m, depending on the site (Keenan et al. 2007). As light levels measured from the platform were lower than measured twilight light levels (Keenan et al. 2007), overall depth of artificial light is likely less than the natural photic zone. In another study of fish and platforms in the Gulf of Mexico, irradiance levels were similar between lit (active) and unlit (inactive) platforms from 10 m to 100 m depth (Foss 2016).*** Lighting around the FPSO may attract phototaxic plankton and may provide increased opportunities for prey capture by fish and other species (Keenan et al. 2007; Cordes et al. 2016) … Such positive ***and*** localized effects would continue while the FPSO was on location for the 12 to 20-year timeframe." Studies on the effects of platform lighting may be confounded by other factors including platform structure, types of lighting, depths, environmental conditions, and discharges. As described in Section 9.2.2.1 of the EIS, fish may be attracted to lit platforms as they

provide better foraging and shelter opportunities (Keenan et al. 2007; Cordes et al. 2016). However, it is difficult to separate the effects on fish behaviour, as also assessed in Section 9.2.2.1, from lighting relative to other factors. Fishes have different light sensitivities and behavioural response to light is variable across species and within species depending on competing priorities (e.g., foraging, predator avoidance, schooling) (Marchesan et al. 2005; Stoner et al. 2008). Studies of fish communities relative to oil and gas platform lighting are useful for determining general behavioural responses, but not individual responses of fish.

Studies indicate weak diel periodicity within 100 m of the platform (Simonsen 2013) and avoidance of the illuminated area at night (Barker 2016). These potential effects of lighting are generally localized to hundreds of meters to less than 1.5 km from source (Keenan et al. 2007; Simonsen 2013; Foss 2016), as described above. Seasonal large pelagics noted to potentially occur within the Project Area (Section 6.1.8.3 of the EIS) that are typically able to migrate on scales of hundreds of kilometres may be attracted to the platform due to increased foraging opportunities during the summer (as described in Section 9.2.2.1 of the EIS). Therefore, potential environmental effects on fishes are localized to within the Core BdN Area with low potential of effects on seasonal large pelagic fishes.

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Keenan, S. F., Benfield, M. C., & Blackburn, J. K. (2007). Importance of the artificial light field around offshore petroleum platforms for the associated fish community. Marine Ecology Progress Series, 331, 219-231.

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	Simonsen, K.A. 2013. Reef fish demographics on Louisiana artificial reefs: the effects of reef size on biomass distribution and foraging dynamics. Ph.D. dissertation. Louisiana State University.

IR-27 **CEAA-13**	**Guideline Ref:** Part 2, Section 3.1	**EIS Ref:** Section 2.8.3
Context/Rationale	Section 2.8.3 of the EIS does not include an evaluation of the transmission of helicopter sound in air or into the water, or the identification of receptors. However, Section 10 of the EIS provides an assessment of airborne sound on marine and migratory birds; however, airborne sound is excluded as an interaction between birds and the Project.	
Request **15-Apr-19**	Provide a rationale as to why airborne sound information was not provided in Section 2.8.3 of the EIS and not identified as an interaction; however, an effects analysis assessment of airborne sound on marine and migratory birds was provided in Section 10.	
Equinor Response **15-Nov-19**	Chapter 2 of the EIS provides a description of project phases and activities carried out during these phases, as well as a description of potential sources of air, light, heat and sound emissions and discharges. An evaluation of the transmission of these emissions and discharges, where warranted, is provided in other chapters of the EIS; receptors for these emissions and discharges are provided in the respective effects assessment chapters of the EIS, Chapters 9-14. As stated in responses to IR-13/CEAA-6;DFO-1 Part H and IR-218/DFO-152, in accordance with Section 3.2 of the EIS Guidelines, the effects assessment of project activities was based on those discharges/activities "which have the greatest potential to have environmental effects." Section 2.8.3 of the EIS states "Atmospheric sound is not of concern for the Project given the anticipated low levels of atmospheric sound emissions, the limited transmission of underwater sound above the surface and location of receptors. Helicopter traffic will generate atmospheric sound at the airport, in transit and at the FPSO and/or drilling installation. However, with the use of the existing St. John's International Airport potential effects on human receptors is reduced. Helicopters are required to avoid important bird areas, so potential interactions with birds are reduced." During the Regulatory Review Workshop in May 2019, ECCC commented that airborne sound was not an interaction of concern for marine and migratory birds. The potential effects of sound associated with aircraft (helicopters) on marine and migratory birds is inseparable from the presence and movement of helicopters. As stated in response to IR-37/CEAA-111 "Interactions associated with sound is limited to project vessels and supporting surveys. The interactions of atmospheric sound associated with helicopters on Marine and Migratory Birds is inseparable from the presence of movement of helicopters." • The 'Sound' interaction in Table 10.3, under Supply and Servicing – Aircraft (helicopters) will be amended to ***"Presence"***. • The text in Section 10.2.4 will be amended to read as: "As indicated in Table 10.3, vessels ~~and helicopters~~ may directly interact with Marine and Migratory Birds as a result of vessel presence and lighting and/or	

	sound***; helicopter*** interaction ***is focused on the presence of the helicopter."*** ~~(vessels and helicopters).~~ • The text in EIS in Section 10.2.4.2 Aircraft (Helicopters), subheading "Sound", first paragraph, page 10-28, will be amended to the following: ***"Presence"*** "The primary interaction associated with helicopter use is the possible disturbance effects of aircraft overflights on birds. These include a possible temporary loss of useable habitat and increased energy expenditure of birds due to escape reactions, increased heart rate, and lower food intake due to interruptions (Ellis et al. 1991; Trimper et al. 2003; and Komenda-Zehnder et al. 2003). ***Helicopter presence (due to movement and sound) can disturb nesting seabirds at colonies, although seabird response to helicopters and other aircraft depends on a number of factors including species, previous exposure levels, and the location, altitude, and number of flights (Hoang 2013).*** In terms of behavioural effects of helicopter presence on birds, flushing of breeding birds from the nest in response to helicopter presence is perhaps the most obvious and can have immediate negative consequences including predation of eggs and chicks and decreased incubation and brooding (Burger 1981; Brown 1990; Bolduc and Guillemette 2003; Beale 2007; and Burger et al. 2010). 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 (Burger 1981; Carney and Sydeman 1999). Other behavioural effects may include reduced foraging and provisioning rates (Davis and Wiseley 1974; Lynch and Speake 1978; Belanger and Bedard 1990; Delaney et al. 2002; Goudie 2006). ***Helicopter presence may also deter birds from favourable habitats and may alter migration paths, resulting in greater energy expenditure (Larkin 1996 and Beale 2007).*** Research has shown that overt behavioural responses to aircraft traffic, such as flushing, may occur at a distance of 366 m for common murres (Rojek et al. 2007), although there is inherent variability in behavioural responses between and even within species (Blumstein et al. 2005 and Hoang 2013)." • The existing text in EIS in Section 10.2.4.3 will be amended to read as: "In summary, with the application of mitigation measures, the residual environmental effects on Marine and Migratory Birds from aircraft (helicopters) ***presence*** are predicted to be adverse, low in magnitude, localized, long-term in duration, occurring regularly, and reversible. This prediction is made with a high level of confidence."

IR-28	**Guideline Ref:** Part 2, Section 3.2	**EIS Ref:** Section 2.10.4.1
CEAA-14		
Context/Rationale	Section 2.10.4.1 of the EIS refers to "the Project's relatively short-term activities and localized disturbances". Characterizing the Project effects as being short-term and localized is not consistent with project components extending almost 30 km by 15 km in the Core Bay du Nord Development Area, and that future project may operate for three to five year periods and up to several decades.	

Request **15-Apr-19**	In Section 2.10.4.1 of the EIS, explain how the Project's effects can be categorized as short-term and localized when project zone of influence is more than one year and extend far beyond the immediate vicinity of sources.
Equinor Response **15-Nov-19**	The statement in the Section 2.10.4.1 EIS will be amended to read as: "In reality, in many cases the likely abundance and spatial and temporal distributions and movements of the VCs limits the potential for interactions and effects with the Project's ~~relatively short-term~~ activities ***and relatively*** localized disturbances." With regards to "localized" see response to IR-34/CEAA-22.

IR-29	**Guideline Ref:** Part 2, Section 5	**EIS Ref:** Section 3.3.1.1
CEAA-109		
Context/Rationale	The EIS Guidelines (section 5) state with respect to engagement with Indigenous groups, the EIS will document "any future planned engagement activities". The EIS states (section 3.3.1.1) "The specific nature, frequency, subject matter and format of such future engagement will be determined through discussion with the various Indigenous groups..."	
Request **15-Apr-19**	In Section 3.3.1.1 of the EIS, describe how Equinor intends to engage with Indigenous groups during the environmental assessment and project development. Provide a proposed draft future plan for engagement with Indigenous groups which includes type and timing of engagement activities.	
Equinor Response **15-Nov-19**	Part 2, Section 5 of the EIS Guidelines requires Equinor Canada to document "any future planned activities" with Indigenous Groups. The Guidelines do not require provision of a draft plan for future engagement. Equinor has stated its approach to future engagement in Section 3.3.1.1 of the EIS reaffirming its commitment to continuing to provide opportunities for information-sharing and exchange as requested or required in the post-EIS period in order to discuss issues and concerns. The specifics of such information-sharing processes (method, frequency, duration) cannot be determined prior to the EA decision but will be developed through discussion with the various Indigenous groups. It is Equinor's position that the description of future engagement activities contained in section 3.3.1.1 of the EIS is sufficient to comply with the Guidelines and that no revision of the EIS is required.	

IR-30	**Guideline Ref:** Part 2, Section 5	**EIS Ref:** Section 3
CEAA-110		
Context/Rationale	Issues raised by Indigenous groups are summarized by Equinor in Table 3.2 of the EIS. However, there are no Proponent responses, only references to sections of the EIS where the issue is addressed.	
Request **15-Apr-19**	Revise Table 3.2 of the EIS to include responses to issues raised by Indigenous groups.	
Equinor Response **15-Nov-19**	Part 2 Section 5 of the EIS Guidelines states that "the Agency recommends the proponent create a tracking table of key issues raised by each Indigenous group and responses provided by the Proponent." Equinor Canada has revised the format of the table to align with the recommendation of the Agency. For each Indigenous group, the table will be	

	modified to include the issues raised by each Indigenous group during engagement activities and specific responses provided by Equinor Canada together with the relevant EIS references, where applicable. Appendix A to this Response Document includes the amended tables (Tables 3.4 through to Table 3.20) and a new Table 3.21, to be included in Chapter 3 of the EIS.

IR-31 **CEAA-15**	**Guideline Ref:** Part 1, Section 3.2.2	**EIS Ref:** Section 4.1, Table 4.1
Context/Rationale	Section 3.2.2 of the EIS Guidelines requires an assessment of the ecological and anthropogenic values of marine fish and fish habitat. This information is not provided in Section 4.2 or Table 4.1 of the EIS, nor is there an assessment of the importance to biodiversity and overall ecosystem.	
Request **15-Apr-19**	A. Update Section 4.2 and / or Table 4.1 in the EIS to identify the role in the ecosystem (ecological value) and anthropogenic values (scientific, social, cultural, economic, historical, archaeological or aesthetic) of marine fish and fish habitat. B. Update the effects analysis as necessary.	
Equinor Response **15-Nov-19**	Section 3.2.2 of the Guidelines addresses the VCs to be examined in the EIS – both in terms of rationale for selection and scope of assessment. The section directs the proponent to describe the selected VCs "in sufficient detail to allow the reviewer to understand their importance and to assess the potential for environmental effects arising from project activities". Table 4.1 and the associated text clearly outline the rationale for selection of Marine Fish and Fish Habitat as a Valued Component. From an ecological perspective, Marine Fish and Fish Habitat is specified as a VC due to its recognized ecological value (see Section 5 of CEAA 2012 and the Species at Risk Act). The social, cultural and economic significance of fish and fish habitat to human users is clearly evidenced by the results of Equinor's ongoing engagement with Indigenous groups and stakeholders. The ecological and anthropogenic values of fish and fish habitat are reflected in statements in Table 4.1 such as "Specifically Indigenous groups identified Atlantic salmon, American eel, swordfish, bluefin tuna, cod, snow crab and herring as fish species that are important and valued for commercial and/or traditional (food, social and ceremonial purposes" and "Marine commercial fisheries are key elements that have shaped the history and socioeconomic character of NL and are important aspects of the current economic and socio-cultural fabrics of the province and other parts of Canada". Table 4.2 identifies the key interactions between the Project and the VC, taking into consideration the views expressed by Indigenous groups and stakeholders during Equinor's engagement activities (see Chapter 3 and Appendix H). Detailed information on the role of fish and fish habitat in the marine ecosystem and on the socio-economic, cultural, historical and aesthetic value of fish and fish habitat to human users is provided in Chapter 6 (Physical Environment) and 7 (Human Environment). A comprehensive assessment of the direct and indirect effects of the Project on fish and fish habitat from both the ecological and anthropogenic perspectives is set out in the following: Chapter 9 – Fish and Fish Habitat; Chapter 12 – Special Areas; Chapter 13 – Fisheries and other Ocean Users; Chapter 14 -Indigenous Peoples; Chapter 15 – Cumulative Effects and Chapter 16 – Accidents and Malfunctions. The level of detail contained in Tables 4.1 and 4.2 and associated text is sufficiently detailed to justify inclusion of fish and fish habitat as a VC. It is also consistent with the	

	level of detail which has been considered acceptable by the CEA Agency in other offshore environmental assessments. Updates to the EIS are not required.

IR-32 **Conformity DFO-1**	**Guideline Ref:** Part 1, Section 4.3	**EIS Ref:** Section 6.1.2; Section 6.1.3
Context/Rationale	The EIS Guidelines state that "In describing and assessing effects to the physical and biological environment, the proponent will take an ecosystem approach…". The analysis required to assess the EIS using an ecosystem approach was insufficient. There is no clear description of the nested structure that characterizes the ecosystem organization in space (e.g., the bioregion, ecosystem production unit, ecoregion levels used by NAFO in describing these ecosystems), and there is an extremely limited perspective on how these ecosystems changed over time and their current productivity state (e.g., see NAFO 2014, 2015, 2016, 2017; Koen-Alonso et al 2019 also summarizes some of this info in the context of the NAFO Roadmap for the development and implementation of an Ecosystem Approach to Fisheries). Consider Pedersen et al. 2017 to describe potentially different conditions/ states/ productivity/ resilience the ecosystem can present over the duration of the project. Given the duration of the Project, it is important to understand the current and past states of these ecosystems to properly assess the impacts of the project. There is also information lacking regarding ecosystem organization at smaller spatial scales (e.g. ecoregion sensu NAFO 2014, Koen-Alonso et al 2019) and the notion of habitat. For a specific examples, see Annex 3, DFO_119, DFO_126.	
Request **15-Apr-19**	Provide an ecosystem approach to the environmental assessment of Project effects.	
Equinor Response **15-Nov-19**	The EIS guidelines do not provide guidance on ecosystem approach. Furthermore, Section 4.3 of the EIS Guidelines state "*except where specified by the Agency, the Proponent has the discretion to select the most appropriate methods to compile and present data, information and analysis in the EIS as long as they are justifiable and replicable.*" Therefore, Equinor Canada and its EIS Team in preparing the EIS used a common EA approach that has been used in multiple previously approved environmental assessments undertaken for other industries and the offshore oil and gas sector, including the recently approved Flemish Pass Drilling EIS (Statoil 2017). Equinor Canada's understanding of an ecosystem approach is detailed in Chapter 4 of the EIS. Further clarity regarding Project activities-VC interactions is provided in response to IRs 37/CEAA-111; IR-98/DFO-144a, IR-144/DFO (21, 109, 145, 145, 150, 153, 162); IR-148/DFO-147; IR-149/DFO-144b; IR-151/DFO-91; IR-198/DFO-144c; and IR-199/DFO-98. The EIS is organized by individual VC and effects assessment to provide a well-structured document and to explicitly address the VC's identified as per the EIS Guidelines. This does not mean that the VC's have been assessed in isolation; they have also been assessed in consideration of the interactions and inter-relationships between VC's. To further clarify this, an additional section will be added at the end of each VC chapter, before the residual environmental effects summary discussion, to summarize the activities-pathways-receptors and linkages between ecosystem components (VC's). It will demonstrate, in table format, the linkages and inter-relationships between ecosystem	

	components. The summary tables for each VC are provided in Appendix B to this Response Document. The text for each relevant VC section is provided below. **VC Section [9.5.1, 10.5.1, 11.5.1, 12.4.1, 13.4.1, 14.4.1] Ecosystem Component Linkages** ***"The interconnections between the physical, biological and human environment have been considered in the EIS and are summarized in [Table ##]. Overall the EIS is based on the interactions between project activities and select VC's using source-pathway-receptor relationships as addressed in Section [9.1, 10.1, 11.1, 12.1, 13.1]. The source is tied to various project activities, and the potential effect on a receptor may be direct or indirect via a pathway. The ecosystem approach recognizes these linkages, or pathways. The ecosystem linkages do not affect significance determinations, as the potential effects (via direct and indirect pathways) on [relevant VC] have been assessed.***"

IR-33 **CEAA-18**	**Guideline Ref:** Part 1, Section 3.2.2, Section 4.3; Part 2 Section 7.2, Section 7.3	**EIS Ref:** Section 4.3
Context/Rationale	In Part 1, Sections 3.2.2, 4.3 and Part 2 Section 7.2 and 7.3 of the EIS Guidelines require taking an ecosystem approach in describing and assessing effects to the physical and ecological environment. Section 4.3 of the EIS describes Equinor's EA approach and method to be in conformity with the EIS Guidelines. However, the effects analyses in Sections 9 to 16 did not conform to Equinor's methodology. As a result, it is not clear how the holistic and ecosystem-based approaches were used in the EIS to substantiate the effects analyses and how significance of effects was determined when measurable changes within or beyond natural variability were not discussed. This information is needed to understand the effects analysis method rationale and linkages between existing environment data, project activities, and literature reviews and the ratings provided in the concluding statements.	
Request **15-Apr-19**	Update the EIS to clearly assess, in an ecosystem approach, potential Project effects based on linkages between project activities for each phase, existing environment data, cited literature, and cumulative effects of the simultaneous operations.	
Equinor Response **15-Nov-19**	See response to IR-32/Conformity DFO-1.	

IR-34 **CEAA-22**	**Guideline Ref:** Part 1, Section 3.2.3	**EIS Ref:** Section 4.3.3
Context/Rationale	In Section 4.3.3 and Table 4.5 of the EIS, two spatial areas are defined as local – "localized" and "local study area". These categories are not clear geographically. The term localized has been used over various distances throughout the EIS that are well beyond the immediate vicinity of the activity.	
Request **15-Apr-19**	Provide a distance metric for "localized" spatial boundary area to ensure consistency throughout the EIS, alternatively provide specific zones of influence.	

Equinor Response 15-Nov-19	The EIS draws a clear distinction between the terms “localized” and “Local Study Area”. The “Local Study Area” (LSA), as defined in Table 4.3, refers to VC-specific spatial study areas, the boundaries of which “encompass the overall geographic area over which all planned and routine Project-related environmental interactions may occur” in relation to the particular VC. The geographic boundaries of each LSA are depicted in each of the individual VC Chapters. “Localized” is not a term of art but is used in Table 4.5 as one criterion of significance. “Localized” refers to the spatial area within which an environmental effect will likely occur, defined as being ‘in the immediate vicinity of the activity’ (see Table 4.5 of the EIS) causing the environmental effect. The determination of when an effect is ‘within the immediate vicinity of the activity’ is highly variable and effect-specific, depending upon the nature and phase of the Project activity, the type of the effect and the VC. It is therefore neither possible nor desirable to provide a uniform distance metric. Where relevant, distances have been provided within which effects are said to be localized (e.g. see for example, Chapter 9 and use of term ‘localized’ in relation to deposition of drill cuttings and produced water discharges). This approach to use of the term ‘localized’ without a uniform distance metric is common practice in the environmental assessment context and has been deemed acceptable by the CEA Agency (see, for example, BP Scotian Basin Exploration Drilling Project, 2016; ExxonMobil, Eastern NL Offshore Exploration Drilling Project, 2017; Husky Energy, Exploration Drilling Project EIS, 2018; and Statoil, Flemish Pass Exploration Drilling Project, 2018). In each of these instances, the term localized was used to describe the range of a potential environmental effect although the geographic extent of such effect varied depending on the Project activity. The term ‘localized’ without an associated constant distance metric has also been used in guidance documents issued by the CEA Agency in relation to the Canadian Environmental Assessment Act (see for example, Determining Whether A Project is Likely to Cause Significant Adverse Environmental Effects and Cumulative Effects Assessment Practitioner’s Guide). A distance metric for ‘localized’ is not required. Appropriate zones of influence are provided where relevant throughout the EIS. Updates to the EIS are not required.

IR-35 **CEAA-23**	**Guideline Ref:** Part 1, Section 3.1	**EIS Ref:** Section 4.3.4.1; Section 9.1.4; Appendix I
Context/Rationale	Section 3.1 of the EIS Guidelines require the proponent to describe the fate (e.g. areal extent) of drilling wastes (e.g. muds, cuttings) using dispersion modelling at various water depths and at various stages of drilling, including during riserless drilling and drilling with the marine riser in place. In the EIS (Sections 4.3.4.1 and 9.1.4, Appendix I), only drill cuttings dispersion was modeled. Also riser-less drilling requires a large quantity of mud to sweep out the top-hole sections, typically an order of magnitude more than cuttings produced. It is not clear if this additional volume was accounted for in the calculation of final overboard discharge of whole WBM as described in Section 2.8.2.2. Table 2.22 of the EIS is missing the drill mud volumes.	

	It is not clear why the proponent relies on drill cutting information from its Norwegian operations, instead of information from its 20 offshore Newfoundland exploration drilling operations.
Request 15-Apr-19	A. Provide an analysis of the zone of influence of water-based mud release at the seafloor and from the batch dump at the surface to assess the effect on water quality and habitat from the release of large volumes of drill mud not adhered to drill cuttings. Add drill mud volumes to Table 2.22. B. Defend the rationale why drill cutting information from Norwegian production projects is relevant to the Project area in the NL offshore and if not, update the assessment with the relevant NL information from Equinor's exploration wells in the project areas.
Equinor Response 15-Nov-19	A. The EIS Guidelines do not provide specific guidance for drill cuttings dispersion modelling. The scope of the drill cuttings dispersion model was determined in consultation with Equinor in-house experts and modellers from Wood, who performed the modelling, and the methodologies and scope from previously accepted drill cuttings dispersion modelling for approved offshore exploration drilling projects (e.g., Statoil 2017). Based on modelling experience, it is estimated that any planned releases of WBM at the surface at the end of drilling a will likely introduce suspended solids into the water column. Bulk releases of WBM, should it be required, from the drilling installation would be expected to occur within the top 20 m of the water column (see Section 2.8.2.2 of the EIS), and expected to last for a relatively short time. The zone of influence of a WBM batch dump at the surface is likely to result in a rapidly diluted plume in the upper 100 to 200 m with mud particles that eventually settle to the seabed in low concentrations and be widely dispersed over distances of several kilometres (based on review of similar analyses, e.g., AMEC 2011, COA 2004 in Jacques Whitford 2004). As indicated in response to IR-127/CEAA-57, information regarding the effects of suspended particles from discharge of drilling wastes will be included in the EIS. For seabed WBM release, Appendix I modelling already incorporates added volume of 167m^3 (see Table 3-2, 3-3, Appendix I) of the mud materials in the 60/40 mud/seawater composition and is therefore considered in the release modelling. Table 2.22 is complete and includes cuttings and mud volumes. The purpose of modelling in environmental assessment is to provide a predication of an estimated zone of influence, or area where impacts may occur, on which the environmental assessment is based. Equinor Canada is very conservative in its estimates of potential zone of influence in the EIS from drill cuttings modelling. As indicated in IR-208/DFO-102, it is predicted that there would be an estimated 0.5 km^2 potential zone of influence associated with a drilling template and cuttings dispersion, which assumes conservatively, that drill cuttings would be discharged approximately 150 m away from the template location. If one were to only use the modelled prediction of 200 m ZOI for drill cuttings, the estimated potential zone of influence would be approximately 0.13 km^2. Furthermore, as indicated in the EIS and in response to IR-146/Conformity ECCC-4;ECCC-25, the effects of drilling cuttings will be included in an environmental effects monitoring program. The approach to modelling is consistent with the modelling used in the recently approved Flemish Pass Drilling EIS (Statoil 2017).

	B. All simulations run for drill cutting modelling are in the BdN Project Area, specifically the modelling location is within the Core BdN Development Area. There are no simulations for other sites in the world. Input cuttings characterization data using international data are employed to provide additional data to reduce uncertainty inherent in modelling. In particular, particle size distribution (PSD) data are rare, it was appropriate to consider international PSD data that Equinor and Wood were aware of (i.e., the two Troll A (Norwegian continental shelf) and one Nedwed (Lower Cook Inlet, Alaska)). Clarification on the use of existing information in the EIS is provided in response to IR-143/ECCC-24. References: AMEC 2011. Old Harry Drilling Mud and Cuttings Dispersion Modelling Final Report. Prepared for Corridor Resources Inc., Halifax NS. Coastal Ocean Associates, 2004. Physical Oceanographic Input to BEPCo. Canada Company EA Report Exploratory Drilling on EL 2407. Prepared for Jacques Whitford Limited, Dartmouth, NS. Jacques Whitford Limited, July 2004. Project NO. NSD18634 Environmental Assessment Report on Exploratory Drilling on EL2407. Prepared for BEPCo. Canada Company. Prepared by Jacques Whitford Limited in association with SL Ross S.L. Ross Environmental Research Ltd. and Coastal Ocean Associates Ltd.

IR-36 **CEAA-24**	**Guideline Ref:** Part 1, Section 3.1; Section 7.3.1	**EIS Ref:** Section 4.3.4.1; Appendix I; Section 12.2.1.1
Context/Rationale	Section 4.3.4.1 and Appendix I in the EIS, gives the volume of cuttings from one well as 898 m^3, but a total volume of 701 m^3 for eight wells. Drill model input in Appendix I shows for a single well in the eight well scenario 96 m^3 of cuttings for drilling a borehole of 445 mm in diameter to a depth of 1580 m, whereas in the one-well scenario 270 m^3 of cuttings is generated drilling a borehole of 445 mm in diameter over the same 1580 m depth. Clarity around these discrepancies is required for assessing the fate and effects of drill wastes as per the EIS Guidelines. In Section 4.3.4.1 and Appendix I, the volume of water-based mud released to the seafloor is not provided in Table 3-2 of Appendix I, or in the associated text of Appendix I. A footnote under Table 3-2 notes that WBM cuttings includes 167 m^3 of barite for both the conductor and surface borehole sections (38 m^3 for the conductor and 129 m^3 for the surface). In Section 12.2.1.1 of the EIS the zone of influence of WBM released at seafloor and the surface was not modeled therefore an effects prediction is not complete. The sensitivity and low resilience of the benthos and slow recovery has been documented in the literature cited, but effects to the ecological processes has not been addressed in the EIS. Section 3.1 of the EIS guidelines requires information on the fate of drill muds using dispersion modeling. The footnote in Table 3-2 does not specify if the barite from the WBM cuttings is associated with the WBM or if it is residual and retained on the WBM cuttings. This information in needed to assess environmental effects of the Project and support the conclusions and summary of effects.	

Request 15-Apr-19	A. Clarify the discrepancies in volume of cuttings for one well (898 m3) and eight wells (701 m3) in the modeling in Appendix I of the EIS for assessing the fate and effects of drill wastes. B. Explain how two different volumes (96 m3 vs. 270 m3) were arrived at for what appears to be the same-sized hole (0.445 m diameter x 1580 m deep) and the implications on the cuttings model results. C. Provide further information on water-based mud volumes anticipated to be used for drilling the top sections of the wells, as more mud than cuttings will be released to the seafloor. D. Update the assessment of the potential effects on the benthic community, areal extent of the loss of sensitive species and habitat in special areas, and potential changes to water and sediment quality for all drill wastes.
Equinor Response 15-Nov-19	A. As stated in the EIS, the Project is in the early stages of design, including well design. The volumes listed in the table are based on two different well designs and use volumes associated with two different well designs. The "Hole Size" and "Depth" columns in Tables 3.2 and 3.3 of Appendix I are not relevant for the modelling and will be deleted to avoid confusion. Modelling was carried out for the 8-well scenario using 701 m^3 volume of cuttings per well and 898 m^3 cuttings for the single well scenario. As stated in response to IR-35/CEAA-23, modelling is a predictive tool used in environmental assessment to estimate potential zones of influence. Furthermore, as clarified in response to IR-146/Conformity ECCC-4;ECCC-25, one of the objectives of environmental effects monitoring is to confirm the EIS predictions, including modelling predictions. B. As stated in response to Part A, the volumes used reflect different well designs and have been incorporated into the modelling. Updates to the EIS are not required. C. See response to IR-35/CEAA-23 Part A. D. Refer to responses to the following IRs: IR-124/CEAA-54, IR-126/CEAA-56, IR-226/DFO-110, and IR-252/CEAA-102.

IR-37 **CEAA-111**	**Guideline Ref:** Part 2, Section 7.3.5	**EIS Ref:** Section 10.2.2; Table 10.3
Context/Rationale	Section 10.2.2.2 in the EIS references behavioural changes: "Small amounts of oil from sheens has been shown to affect the structure and function of seabird feathers (O'Hara and Morandin 2010), which has the potential to result in water penetrating plumage and displacing the layer of insulating air, resulting in loss of buoyancy and hypothermia. This can in turn cause a heightened metabolic rate (increased energy expenditure), as well as behavioural changes such as increased time spent preening at the expense of foraging and breeding, and potentially death, especially in the winter months when conditions are colder, and thermoregulation is most difficult (Morandin and O'Hara 2016)." Reading this, it seems there should be an ineraction under Production and Maintenance Operations – Produced Water and/or Other Waste Discharges. The following sections reference Section 10.2.2 to say the effects will be similar, so it seems that there should be bullets under Change in Avifauna Presence and Abundance (Behavioural Effects) for:	

	• Discharges and Air Emissions (Offshore Construction and Installation, Hook-up and Commissioning) • Marine Discharges (Hook-up and Commissioning) • Other Waste Discharges (Production and Maintenance Operations) For Air Emissions (including flaring) under both Production and Maintenance Operations and Drilling Activities, there is a bullet for Change in Food Availability. Therefore, a description is missing in the text or reference to another section that contains the description is missing. Similarly, under Drilling Activities, descriptions for how conclusions were made about Change in Food Availability or Change in Mortality are missing. Page 10-27 (Section 10.2.3.3) says predications about adverse, low in magnitude, localized effects… are made with a high level of confidence for drill cuttings and moderate level of confidence for Other Waste Discharges but it is not clear how those conclusions were drawn.
Request 15-Apr-19	Revise the EIS for continuity and consistency in identifying Project – VC interactions and associated effects with the effects analysis.
Equinor Response 15-Nov-19	With regards to potential interactions from the discharge of other wastes, other than produced water, as stated in response to IR-13/CEAA-6;DFO-1 Part H, waste discharges assessed in the EIS are those that are considered to have the greatest potential for effects. Marine discharges (other than produced water) are treated in accordance with regulatory requirements and are not expected to have an effect on Marine and Migratory Birds. The following text will be included in Section 10.1.5.1, prior to Table 10.3 ***"In accordance with Part 2, Section 3.2 of the EIS Guidelines, the effects assessment of project activities is based on those discharges/activities "with the greatest potential to have environmental effects." This is based on scientific literature, research studies, Indigenous knowledge, input from Indigenous groups and stakeholders, and professional experience of the EIS team. The primary interaction with Marine and Migratory Birds is lighting emissions. For marine discharges, while the focus is on produced water, other marine discharges as assessed as appropriate. Interactions associated with sound is limited to project vessels and supporting surveys. The interactions of atmospheric sound associated with helicopters on Marine and Migratory Birds is inseparable from the presence of movement of helicopters."*** Table 10.3 of the EIS will be amended to include an interaction for "Change in Avifauna Presence and Abundance (Behavioural Effects)" under Production and Maintenance – Waste Management – Marine Discharges and Emissions – Produced Water as illustrated in below:

Table 10.3 Potential Project-VC Interactions and Associated Effects: Marine and Migratory Birds

Project Component / Activity	Potential Environmental Effects			
	Change in Habitat Availability and Quality	Change in Food Availability and Quality	Change in Avifauna Presence and Abundance (Behavioural Effects)	Change in Mortality / Injury Levels and Health or Individuals or Populations
• Produced Water		•	•	•

	The following text in Section 10.2.3 will be amended to read as: "As indicated in Table 10.3, the potential interactions associated with drilling activity include the presence of the drilling installation (including light and sound), waste management and flaring associated with formation flow testing. Waste discharges would have the same interaction and effects as discussed above under FPSO (see Section 10.2.2.***2***), ***with the exception that no produced water will be generated*** and are not discussed here." The following text in Section 10.2.3.1 will be amended to read as: "The potential effects of light emissions from the drilling installation on Marine and Migratory Birds are similar to those assessed in Section 10.2.2 ***and 10.2.2.1***." Regarding interactions listed under air emissions, specifically for production and operations, the flare is also considered a light source, and the interactions would be the same as those assessed under lighting. The EIS will be amended to include the following text in Section 10.2.2.2. ***"When flaring occurs, it will contribute to the overall light emissions from the FPSO. As a result, the flare, acting as a light source, may contribute to the attraction of prey, as assessed above in Section 10.2.2 and 10.2.2.1."*** Confidence or certainty predictions are based on applicability and availability of data on which effects predictions are determined. Upon review of the information presented in Section 10.2.3 on the effects of drilling activities on Marine and Migratory Birds, the level of confidence should be moderate, rather than high. The text in Section 10.2.3.3 will be amended to read as: "In summary, with the application of mitigation measures, the residual environmental effects on Marine and Migratory Birds from drill cuttings are predicted to be adverse, low in magnitude, localized, medium-term in duration, occurring regularly, and reversible. This prediction is made with a ***moderate*** ~~high~~ level of confidence."

IR-38 **CEAA-28**	**Guideline Ref:** Part 2, Section 7.1.2	**EIS Ref:** Section 5.1.2
Context/Rationale	Equinor conducted Project specific seafloor surveys in geotechnical and environmental surveys; however, Section 5.1.2 of the EIS, seafloor geology was not describe within the areas of deposition of drill wastes, and within disturbance areas from subsea infrastructure installation and protection in the Core BdN Development Area and Project Area. As per Section 4.3.3 of the EIS," the current condition of an environmental component as a result of natural and/or anthropogenic factors, and thus, its resulting resiliency or sensitivity to further change (ecological / socioeconomic context) is considered integrally as part of the prediction of environmental effects and is summarized in the effects summary tables provided for each VC". The description of the seafloor sediment is highly variable (sand, gravel, Holocene silty mud, winnowed sand, coarser-grained sediments, finer grained sediments, ice-rafted cobbles and or boulders) but does not correspond to the Figure 5-3 on seabed features which shows sandy mud and muddy sand. This information is important for habitat characterization which dictates, in part, infaunal and epifaunal communities and substantiates effects analysis on changes to the environment.	

Request 15-Apr-19	A. Using seafloor surveys conducted in 2016 and 2018, describe, and provide figures of, the seafloor (habitat) characteristics in the Core BdN Development Area predicted to be affected by drill waste deposition and disturbance from other subsea infrastructure. B. Describe seafloor survey findings on drill cutting mounds from previous exploration drilling projects conducted by Equinor or other operators in the Flemish Pass and Project Area to substantiate statements of benthic recovery, C. Provide graphic overlays of existing seafloor sediment type and benthic communities with the drill mud and cutting deposition to demonstrate the zones of influence in the Core Bay du Nord Development Area and the types of habitats and benthic communities predicted to be affected.
Equinor Response 15-Nov-19	A. Information respecting the seafloor habitat characteristics within the Project area and which may be affected by drill cuttings deposition and disturbance is contained in Section 5.1. Information respecting habitat characteristics of fish habitat is contained in Chapter 6 (for example, Sections 6.1.4, Section 6.1.7). In addition, data from existing pre-drill seabed surveys and a seabed survey in 2018 are included in Section 6.1.7.5, including figures depicting benthic species observed. The 2018 Survey was undertaken to support ongoing Project design and to provide benthic and fish habitat information for the Core BdN Development Area through the survey of representative locations based on proposed subsea layout. Furthermore, as indicated in response to IR-126/CEAA-56 additional benthic habitat information will be included in the EIS. B. While Equinor Canada has some multibeam echo sonar (MBES) data (see response to IR-220/Conformity DFO-5) that estimates the likely extent of drill cuttings from previously drilled wells in the Core BdN Development Area, prior to CEAA 2012 follow-up programs for exploration drilling were not required. As a result, Equinor Canada is unable to provide the information requested. In the absence of data from previous exploration drilling programs, Equinor Canada has relied on scientific literature and results from effects monitoring programs for ongoing production operations, including production drilling, (see response to IR-126/CEAA-56) to support the effects assessment predictions. The use of peer-reviewed scientific literature to substantiate environmental effects predictions is recognized by the EIS Guidelines (see section 4.3) and is consistent with approach of other NL offshore environmental assessments (EMCP 2011, 2017; Stantec Consulting 2018, Statoil 2017). It is the opinion of Equinor Canada that the level of detail provided in the EIS is sufficient to determine potential impacts to benthic habitat associated with the BdN Development, consistent with the use of an environmental assessment as a planning tool for the overall BdN development. Information on environmental effects on benthic habitats, including recovery, is included in Section 9.2.1, 9.2.2, 9.2.3 and 9.2.6 and addressed in responses to IR-107/CEAA-36; IR-124/CEAA-54, IR-126/CEAA-56; IR-127/CEAA-57; IR-226/DFO-110 and IR-252/CEAA-102. C. As stated above, such data has not been required for any previous exploration drilling programs and therefore Equinor Canada cannot provide the information requested. As has been the case with previous offshore exploration drilling projects, the zones of influence for drilling muds and cuttings depositions have been determined based upon modelling of the proposed spatial extent of the subsea infrastructure and relevant scientific literature. This approach is consistent with the approach used in the recently approved Flemish Pass Exploration Drilling Program EIS (Statoil 2017) which has been deemed acceptable by the CEA Agency.

IR-39	**Guideline Ref:** Part 2, Section 7.1.2	**EIS Ref:** Section 5.1.3.2
NRCan-4		
Context/Rationale	Sediment failure is essentially a consequence of gradient, magnitude of seismic acceleration and sediment strength. Most continental margin sediments, except on slopes of more than a few degrees, are relatively stable and would require seismic accelerations associated with a large earthquake (magnitude of five or greater) to fail (Nadim et al. 2005). To better understand sediment instability and sediment failure risk to the Project Area, NRCan recommends that the proponent compare the geological conditions in the Flemish Pass with Ormen Lange in Norway, including descriptions on how they differ.	
Request 15-Apr-19	A. Compare the geological conditions (e.g. excess pore pressure) in the Flemish Pass with Ormen Lange in Norway, including descriptions on how they differ. B. Update the EIS to determine if the risk is present in this area of offshore NL (e.g. potential for landslide from Sackville Spur which is upstream of the project area)	
Equinor Response 15-Nov-19	A. Equinor Canada undertook a site-specific geohazard assessment (i.e., landslide, shallow gas, gas hydrates) (Fugro 2017) that was used in the EIS for the assessment of geohazard potential (refer to Sections 5.1.3 and 17.2.1) and a site-specific seismic hazard assessment (Golder Associates 2014). The information from these studies provides site specific analyses and is more informative than a comparison with the Ormen Lange field. For clarity, the following edits will be made to Section 17.2.1 of the EIS: "The Ormen Lange field development activities had negligible effects on stability and were determined to not trigger tsunami-generating slides, as a slide risk assessment indicated that only natural causes (i.e., extremely strong earthquake) are a realistic trigger mechanism. The annual probability of a slide with a run out of the ***Ormen Lange*** field development area is almost zero (Scandpower 2004). Hazards related to the Ormen Lange subsea processing facilities from landslide risks were determined to be negligible ***(Nadim et al. 2005); a separate case study for Ormen Lange indicated that transport, collision and landslide risks were negligible at less than 10^{-6} per year)*** ~~(Nadim et al. 2005;~~ (Lloyd's Register Consulting 2013)." B. Environmental assessment is a planning tool and provides an overview of the potential for geohazard events. The data from these reports is considered in the overall project design. Updates to the EIS are not required. References: Fugro. 2017. Desktop Geohazards Study, Northern Flemish Pass, Fugro Document No.: 20170018-RPT-001 Rev 0. Statoil Project No.: ST17452, Volume 1 of 1. Nadim, F., T.J. Kvalstad, and T. Guttormsen. 2005. Quantification of risks associated with seabed instability. Marine and Petroleum Geology, 22: 311-318. Golder Associates. 2014. Site-Specific Seismic Hazard Analysis. Flemish Pass Project Site, Newfoundland, Canada. November 2014. 52 pages. Scandpower Risk Management AS. 2004. Slide Risk Assessment in the Ormen Lange Field Development Area. Presentation. https://doi.org/10.2118/86703-MS.	

	Lloyd's Register Consulting. 2013. Pushing the Limits–Hazards Related to Subsea Processing Facilities. Presentation at INTSOK Deep Water Conference, 14 November 2013, Perth Australia.

IR-40	**Guideline Ref:** Part 2, Section 7.1.2	**EIS Ref:** Section 5.1.3.2
NRCan-5		
Context/Rationale	NRCan's analysis indicates that the probability of a large landslide in offshore eastern Canada is one approximately every 20,000 years, and a minor one may occur every few thousand years. Most of the large failures on the seabed date back more than 10,000 years during periods of glaciation, when substantial amounts of sediment were deposited directly onto the slope of the continental shelf (NRCan 2010).	
Request 15-Apr-19	Provide a quantitative analysis of possible recurrence based on literature information for submarine landslides.	
Equinor Response 15-Nov-19	Section 5.1.3 of the EIS discusses the probability of small and large landslides based on available literature and is summarized in Section 17.2.1 of the EIS.	

IR-41	**Guideline Ref:** Part 2, Section 7.1.2	**EIS Ref:** Section 5.1.3.4
NRCan-6		
Context/Rationale	According to Fugro (2017), shallow sediments within the Project Area are generally interpreted to be primarily fine-grained and likely lack sufficient porosity for the development of massive hydrate zones. If gas hydrates are present, they are likely localized and disseminated within the fine-grained sediment in the form of small crystals, small to large nodules, lenses and partings, or thin veins. No direct hydrate encounters or issues related to hydrates have been recorded in wells or cores in the region covered by the Project Area (Fugro 2017). Furgo (2017) maintains that the shallow sediments are not gas hydrate zones, however, gas hydrates have been identified in the Flemish Pass and Sackville Spur Area.	
Request 15-Apr-19	A. In Section 5.1.3.4 of the EIS provide evidence of the presence and extent of gas hydrates in the Flemish Pass and Sackville Spur Area. B. Explain how gas hydrates would impact the sediment stability in the greater production area and Northern Flemish Pass and effect the project. C. Identify data and knowledge gaps	
Equinor Response 15-Nov-19	A. Equinor Canada drilled 16 exploration wells (see IR-220/Conformity DFO-5) and 10 geotechnical boreholes in the Project area and did not encounter gas hydrates in any of these wells. As the reviewer references, the EIS states that "No direct hydrate encounters or issues related to hydrates have been recorded in wells or cores in the region covered by the Project Area (Fugro 2017)." In addition, as indicated in Section 2.3 of the EIS pilot wells may be required. Pilot wells are drilled to provide an assessment of shallow hazards (IR-5/DF0-37). B. Gas hydrates itself will not impact the sediment stability in the project area. Risk associated with gas hydrates is melting, which would only occur if 1) pressure drops or 2) temperature increases. Pressure drops are only expected if there is an ice age.	

	Temperature increases may be caused by production wells, however the increase in temperature is likely in a localized zone (within meters from well bore) and unlikely to cause a major landslide. C. EIS conclusions are evidence based, using all available information as described in Section 4.3.3. Uncertainties associated with predictions are noted in the EIS. Updates to the EIS are not required. References: Fugro. 2017. Desktop Geohazards Study, Northern Flemish Pass, Fugro Document No.: 20170018-RPT-001 Rev 0. Statoil Project No.: ST17452, Volume 1 of 1.

IR-42 **NRCan-7**	**Guideline Ref:** Part 2, Section 7.6	**EIS Ref:** Section 5.1.3.6
Context/Rationale	Leonard et al. (2012) assume that a mean local run-up greater than or equal to 1.5 m could result from failures with an along-slope extent of 50 km or more, and a mean local run-up greater than or equal to 3.0 m may be produced from failures of 70 km or more in length. In the Flemish Pass, the expected recurrence interval of landslides with an extent of 50 km or more is approximately 21,000 years. The proponent does not reference the earthquake and tsunami of 1929 in Section 5.1.3.6 of the EIS. In NRCan's view, this should be referenced in the EIS and its importance to regional earth stability assessment should be provided.	
Request **15-Apr-19**	A. Provide reference to the 1929 earthquake and tsunami in the EIS. B. Describe its importance to regional earth stability assessment.	
Equinor Response **15-Nov-19**	A. The following text will be added to Section 5.1.3.6 of the EIS. "Tsunami hazard along the Atlantic coast of Canada, including the Project Area, is relatively low. ***The only historical submarine landslide-triggered tsunami documented on the east coast of North America was the November 1929 event that resulted in 28 deaths in Newfoundland (Leonard et al. 2012, NRCan 2019). The epicenter of the quake occurred in the Laurentian Fan, approximately 250 km south of Newfoundland (Piper et al 1985). For the Project Area,*** there are no active plate boundaries nearby to generate tsunamis by displacement of the seafloor, but submarine landslides triggered by earthquakes can produce a tsunami. ***The earthquake (M=7.2) that triggered the 1929 submarine landslide was estimated to have a return period between a few hundred and one thousand years (Clague et al. 2003). However, it is acknowledged that not all earthquakes of this size will trigger a landslide that results in a tsunami (Leonard et al. 2010)."*** B. Stability assessment is addressed in Section 5.1.3.2 of the EIS. The location of the 1929 Grand Banks earthquake was along a trailing-edge plate margin which generally has a low risk of earthquake-induced tsunamis and is considered an unusual geological event in the area (Piper et al., 1985). The information in the EIS is complete. Updates are not required. References: ***Clague J.J, A. Munro, and T Murty, 2003. "Tsunami Hazard and Risk in Canada". Natural Hazards 28, pp. 433 - 461.***	

	Leonard L.G., R.D. Hyndman, and G.C. Rogers, 2010. "Towards a National Tsunami Hazard Map for Canada: Tsunami Sources". Proceedings of the 9th U.S. National and 10th Canadian Conference on Earthquake Engineering. July 25-29, Toronto, Canada. Paper No. 1844. ***NRCan. 2019. The 1929 Magnitude 7.2 "Grand Banks" earthquake and tsunami. Available at: http://earthquakescanada.nrcan.gc.ca/historic-historique/events/19291118-en.php*** ***Piper D. J. W., A. N. Shor, J. A. Farre, S. O'Connell, and R. Jacobi, 1985. "Sediment slides and turbidity currents on the Laurentian Fan: Sidescan sonar investigations near the epicentre of the 1929 Grand Banks earthquake." Geology, 13, p 538-541.***

IR-43 **ECCC-13**	**Guideline Ref:** Part 2, Section 7.1.2	**EIS Ref:** Section 5.6.3
Context/Rationale	In Section 5.6.3 of the EIS, Equinor cites the IPCC (2013) pan-Arctic changes in sea ice extent and thickness. They conclude that future ice extent and thickness of the seasonal ice (i.e. first-year ice) would likely be reduced in the Project Area. The assessment does not consider literature that suggests that with increased warming, we should expect to see increases in thick multi-year ice from the Arctic Ocean being transported southward and eventually reaching offshore Newfoundland. The processes of thick multi-year ice being transported from the higher latitudes in response to warming temperatures has been noted in the literature and is expected to increase further with more warming (e.g. Howell et al., 2013; Kwok et al., 2010). Barber et al. (2018) recently showed that this process can happen and with more warming it is expected to happen more frequently. A similar process could possibly occur with icebergs (which may affect transport and deterioration rates). References: Barber, D. G., Babb,D.G., Ehn, J.K.,Chan,W., Matthes, L., Dalman, L. A., et al. (2018). Increasing mobility of high Arctic Sea ice increases marine hazards off the east coast of Newfoundland. Geophysical Research Letters, 45, 2370–2379. https://doi.org/10.1002/2017GL076587 Howell, S. E. L., Wohlleben, T., Dabboor, M., Derksen, C., Komarov, A., & Pizzolato, L. (2013). Recent changes in the exchange of sea ice between the Arctic Ocean and the Canadian Arctic Archipelago. Journal of Geophysical Research: Oceans, 118, 1–13. https://doi.org/10.1002/jgr20265 Kwok, R., Toudal Pedersen, L., Gudmandsen, P., & Pang, S. (2010). Large sea ice outflow into the Nares Strait in 2007. Geophysical Research Letters, 37, L03502. https://doi.org/10.1029/2009GL041872.	
Request **15-Apr-19**	Provide a discussion of how increased transport of multi-year ice from the high Arctic (as described in recent literature) may affect project phases in the Project Area.	
Equinor Response **15-Nov-19**	The following text will be added to Section 17.2.3, at the end of the section: ***"It is also noted that with the changing climate and shrinking Arctic sea ice cover the Arctic ice pack is more mobile. There is increased advection of pack ice from the Arctic Ocean to Baffin Bay (Barber et al 2018). This is via the Nares Strait from the Lincoln Sea, and Jones Sound and Lancaster Sound from the Canadian Arctic Archipelago (CAA). For example, Howell et al (2013) report on***	

	recent increases in the flow of multiyear ice (MYI) from the Arctic Ocean to the Queen Elizabeth Islands due to increased open water in the CAA that has allowed more inflow to occur. The pack ice in Baffin Bay makes its way south, via the West Greenland Current and Labrador Current, to coastal Labrador, the northeast coast of Newfoundland and the NL offshore area. The increased mobility of sea ice from the Arctic poses a potential added risk of increased MYI for these more southerly regions, as suggested by Barber et al. (2018) who report on an anomalous ice cover in spring 2017 off the northeast coast of Newfoundland with medium (100 to 500 m) and small (20 to 100 m) floes of old ice (second year or MY ice) in 3/10 concentration during the weeks of June 5th to 19th. Old ice was also reported in trace amounts just east of St. John's for the week of April 3rd. Old ice is harder, stronger, and usually thicker than FYI: the presence of old ice represents an increased risk to navigation and should be avoided whenever possible. As reported in Section 5.6.1, old ice has been reported infrequently and at concentrations of 1/10 or less for the past 30 years for the Project Area (mid-March to early April in 1994 and one week in April 1995) and the vessel traffic routes (two weeks in March 1994 for the east route; one week in March 1992 for the west route, at 3/10 concentration). While difficult to quantify the timing, locations and magnitude, this increased mobility of the Arctic pack ice may pose added risk of increased MYI for the Project Area in the future. However, it should be noted that sea ice extent and ice thicknesses will be reduced in the future." References: ***Barber, D. G., Babb,D.G., Ehn, J.K.,Chan,W., Matthes, L., Dalman, L. A., et al. (2018). Increasing mobility of high Arctic Sea ice increases marine hazards off the east coast of Newfoundland. Geophysical Research Letters, 45, 2370–2379. https://doi.org/10.1002/2017GL076587.*** ***Howell, S. E. L., Wohlleben, T., Dabboor, M., Derksen, C., Komarov, A., & Pizzolato, L. (2013). Recent changes in the exchange of sea ice between the Arctic Ocean and the Canadian Arctic Archipelago. Journal of Geophysical Research: Oceans, 118, 1–13. https://doi.org/10.1002/jgr20265.***

IR-44 **Con CEAA-29**	**Guideline Ref:** Part 2, Section 7.1.1; Section 7.3.4; Section 7.8.3.1	**EIS Ref:** Section 5.7.3
Context/Rationale	In Section 5.7.3 of the EIS, no information was provided on existing light levels in the Core BdN Development Area, other than "light levels in the area are dominated by naturally occurring sources". This information is required because light effects are a concern and in order to determine a change in habitat for birds or fish, it is important to describe the existing conditions as required in the EIS Guidelines	
Request **15-Apr-19**	In Section 5.7.3 of the EIS, describe the existing natural sources of light in the Core BdN Development Area to understand the natural variability in the existing night conditions and update the assessment of potential changes to fish and marine bird habitat from underwater light levels and outdoor light levels.	
Equinor Response **15-Nov-19**	As stated in the Section 5.7.3 of the EIS, light levels in the Project Area are "dominated by naturally occurring sources." These naturally occurring sources of light approximately 500 km from the nearest shoreline are sunlight during daytime hours, and moonlight during	

	nighttime hours. It is understood that during a full moon there would be greater nighttime illumination offshore, particularly on nights without cloud cover. As described in Section 2.8.3 of the EIS, anthropogenic sources of light from the Project would be from light sources on the FPSO, drilling installation and project vessels in the area. Non-routine flaring events would also provide a source of source of lighting, when these occur (refer to Section 2.7.1.4 of the EIS). Effects from lighting on VCs, including fish and marine and migratory birds, are addressed in Section 9.2.2.1 and 10.2.2.1, respectively. In assessing the effects of lighting on Marine Fish and Fish habitat and Marine and Migratory Birds, without knowing actual light levels, as the Project is still in early design, it is assumed that any source of artificial lighting from Project activities would provide some level of interaction, as all other sources of anthropogenic light are from transient vessels in the area. Refer to the respective sections referenced above for more information on the effects of lighting on these VCs. Responses to IR-26/CEAA-12 and IR-115 also address effects of lighting on Marine and Migratory Birds and Marine Fish and Fish Habitat. Section 5.7.3 of the EIS is complete. While it was indicated at the Regulatory Review Workshop (May 2019) that the EIS would be amended to provide clarity in the EIS, based on further review of the information in the EIS, Equinor Canada is of the opinion that the EIS is complete and further updates are not required.

IR-45	**Guideline Ref:** Part 2, Section 7.1.1	**EIS Ref:** Section 8.2
ECCC-19 **NRCan-1**		
Context/Rationale	Section 8.2 of the EIS acknowledges that volatile organic compounds (VOCs) would be released during the life of the Project, but does not include VOCs in the Project emission inventory. Assessments indicate that the quantities of VOCs released from Project activities are expected to be small and will disperse quickly from the sources at these offshore locations, and that there are no sensitive receptors within the Project Area that would be exposed to the VOCs after release due to the remote location of the Project. However, the EIS Guidelines state that "quantifying emission sources for, but not limited to, the following contaminants: total suspended particulates, fine particulates smaller than 2.5 microns (PM2.5), respirable particulates of less than 10 microns (PM10), carbon monoxide (CO), sulphur oxides (SOx), nitrogen oxides (NOx), and volatile organic compounds (VOCs)". The proponent's rationale for not including the VOCs in the Project emission inventory is not supported by the literature. VOCs are a pollutant of concern. According to the UNEP, offshore oil and gas drilling, including well testing is a source of fugitive VOCs. VOCs contribute to the formation of tropospheric ozone, a short-lived climate pollutant (SLCP). In addition, considering the total numbers of wells planned (up to 40, plus up to 20 additional for potential future development) for this Project and a production life of 30 years, VOCs emissions could be significant. Therefore, VOCs should be included in the Project emission inventory.	
Request **15-Apr-19**	A. Provide the justification for omitting the quantification of VOC emissions	

	B. Provide an assessment of VOCs from project sources, including both from combustion and fugitive sources. C. Describe any mitigation measures that will be implemented to reduce these emissions and their efficacy.
Equinor Response 15-Nov-19	Chapter 8 of the EIS will be amended to include VOC emissions. An updated Chapter 8 is appended to this Response Document (Appendix C), which includes all edits and amendments as identified in responses to this IR-and IR-47/ECCC-21, IR-48/NRCan-3, IR-49/ECCC-22, IR-50/ECCC-23 and IR-51/NRCan-2. Mitigation measures are provided for in Section 2.6.2 and Section 8.4 of the EIS. The amendments to Chapter 8 do not alter the conclusions of the EIS respecting air emissions.

IR-46	**Guideline Ref:** Part 2, Section 7.3.8.1	**EIS Ref:** Section 8.4
ECCC-20		
Context/Rationale	Section 8.4 in the EIS, Equinor notes that excess gas will be reinjected into the reservoir; it is not clear what kind of compression reinjection system will be used, as emissions would be expected to be coming from these systems.	
Request 15-Apr-19	A. Outline how excess gas reinjection is planned to be carried out. B. Provide details on the compression equipment to be used, and identify any fugitive GHG emission rates.	
Equinor Response 15-Nov-19	A. Section 8.4 of the EIS, as referenced by the reviewer, is a summary of mitigation measures. Section 2.6.2 of the EIS will be updated to include the following text: "…The remaining gas volume (90 to 95 percent) will be re-compressed and reinjected into the reservoir for pressure support. No routine flaring of produced gas will take place. ***Gas will be collected from the first and second stage separators and routed to the injection compression train where the pressure of the gas is successively increased to the required pressure for injection into the reservoir. Gas from the first stage separator will be routed directly to the low-pressure suction side of the injection train. Gas from the second stage separator will be routed through a set of re-compressors to the same injection compressor train.*** ***As the design of the Project is in the early stages, compression equipment has not been selected. Equinor Canada will provide details on compression equipment and emissions to C-NLOPB, which may occur through the Development Plan Application phase or the OA application phase."*** In the technical workshop on 08-May-2019, the C-NLOPB indicated that gas is a resource and there are limitations on quantities that can be flared. Section 2.8.1.1 of the EIS clearly indicates Equinor Canada's commitment to providing a flaring plan to the C-NLOPB during the OA application phase. The statement in Section 2.8.1.1 will be updated to read as:	

	"In accordance with ***Section 6(e) of the Newfoundland Offshore Petroleum Drilling and Production Regulations***, Equinor Canada will submit a flaring plan to the C-NLOPB as part of the OA process."" B. See response to Part A.

IR-47 **ECCC-21**	**Guideline Ref:** Part 2, Section 7.3.8.1	**EIS Ref:** Section 8.5, Tables 8.3, 8.4, 8.6, 8.7, 8.8, 8.9, 8.10
Context/Rationale	In Section 8.5 of the EIS the emissions factors for similar items in various tables are not consistent and some of the results for individual pollutants do not seem to match the ratios of the emission factors. This may be due, in part, to a change in the order of pollutants (CO and SO2) in the row headings that may or may not be reflected in the emission factors and subsequent calculations.	
Request **15-Apr-19**	Verify the emissions factors and resulting calculations in all air emission tables.	
Equinor Response **15-Nov-19**	Equinor Canada and the EIS team reviewed the emission factors and resulting emission estimates provided in Chapter 8. The emission estimates presented in Tables 8.4, 8.6, 8.7, 8.11, 8.12, 8.13 are correct. The following bullets provide additional information regarding the emission factors. • Diesel CAC emission factors are consistent for all diesel sources. • A sulphur mass balance was used to estimate SO_2 emissions from helicopter sources, as opposed to the emission factor presented in Table 8.3. The SO_2 emission factor for helicopters in Table 8.3 will be removed to be consistent with Tables 8.8, 8.9 and 8.10, which do not present an emission factor for SO_2 from helicopter sources. Table 8.3 in the EIS will be amended to include these changes. Refer to Appendix C of this response document for the revised Chapter 8. • The emission factors for FPSO presented in Table 8.9 differ from those presented in Tables 8.8 as they correspond to different power generation technologies (reciprocating engines versus turbines). Updates are not required. • During the review of the tables in Chapter 8, it was noted that the emission factors for SO_2 and CO were reversed in Table 8.10 (i.e., CO emission factors were presented under the SO_2 table header). Table 8.10 in the EIS will be amended with the correct headings. Refer to Appendix C of this response document for the revised Chapter 8.	

IR-48 **NRCan-3**	**Guideline Ref:** Part 2, Section 7.1.1	**EIS Ref:** Section 8.5
Context/Rationale	Flaring emission factors presented in Table 8.17 do not seem to be consistent with the emission factors in a Norwegian Oil and Gas Association guidance document located with an internet search (https://www.norskoljeoggass.no/contentassets/cd872e74e25a4aadac1a6e820e7f5f95/044---guidelines-for-discharge-and-emission-reporting.pdf). For example, proponent uses a CO_2 flaring emission factor of 2.34 t/t (described as tonne of contaminant per tonne of fuel consumed), yet the Norwegian Oil and Gas Association guidance document recommends a CO_2 flaring emission factor of 3.72 tonnes/Sm^3. Similar discrepancies are apparent in the CH_4 and N_2O flaring emission factors.	

Request 15-Apr-19	Verify the emission factors used for flaring for clarity and accuracy of information.
Equinor Response 15-Nov-19	The CO_2 emissions from flaring were estimated by Equinor based on reported emissions from flaring at comparable production facilities in Equinor's global portfolio and did not use emission factors. The CO_2 emissions from flaring during an accidental flaring event were calculated based on the anticipated volume of gas to be flared during the event, the duration of the event, and CO_2 content of the gas. Equinor. Emissions of CH_4/N_2O were not estimated from flaring since the contribution to GHGs during the short duration of non-routine/safety flaring events become largely marginal from these components. The GHG emission factors presented in Table 8.17 for the FPSO are on a tonnes per thousand cubic metre basis and not the tonnes per tonne basis indicated in the table header. An amended Table 8.17 can be found in the revised Chapter 8, which is appended to this Response Document (refer to Appendix C)

IR-49 **ECCC-22**	**Guideline Ref:** Part 2, Section 7.3.8.1	**EIS Ref:** Section 8.5.2.2
Context/Rationale	Section 8.5.2.2 of the EIS does not provide the derivation methodology or assumptions for GHG quantification. This does not readily allow for quantitative evaluation of greenhouse gas emissions.	
Request 15-Apr-19	Provide the appropriate methodology and assumptions made to estimate greenhouse gas emissions (for example, what activity data was used, provide references when possible).	
Equinor Response 15-Nov-19	The methodologies and assumptions used to estimate emissions of greenhouse gases were provided in Sections 8.5.1.2, 8.5.2.2, 8.5.3.2, and in Appendix K of the EIS. The CO_2 emissions presented in Chapter 8 were provided by Equinor Canada and were based on experience from Equinor's global operations. The CH_4 and N_2O emissions presented in Chapter 8 were either calculated by Stantec (air emissions modeler and author of Chapter 8) or were provided by Equinor Canada. N_2O emissions from the offshore support, supply vessels, and helicopters were calculated by Equinor. CH_4 and N_2O emissions from flaring and N_2O emissions from the offshore support and supply vessels were estimated by Equinor. Emissions of CH_4 from fugitive releases (both for concurrent drilling and production, and accidental events) were estimated by Equinor based on the BdN FPSO Concept Study (2017). The remaining CH_4 and N_2O emissions were calculated by Stantec using produced gas information provided by Equinor Canada (i.e., fuel consumption data) and fuel-based emission factors, as presented in Tables 8.6 and 8.17. There is one clarification with respect to the units of the emission factors for the gas-fuelled sources presented in Table 8.17 which is addressed in response to IR-48/NRCan-3. While it was indicated at the Regulatory Review Workshop (May 2019) that the EIS would be amended to provide clarity regarding assumptions used in the EIS, based on further review of the information in the EIS, Equinor Canada is of the opinion that the EIS provides sufficient information regarding assumptions used in air emissions modelling.	

IR-50 **ECCC-23**	**Guideline Ref:** Part 2, Section 7.3.8.1	**EIS Ref:** Section 8.5.4
Context/Rationale	Section 8.5.4 of the EIS states that since existing and future facilities generally meet onshore ambient air quality regulations within three kilometres of the structure, there is therefore no spatial overlap. This is not necessarily true, one can only determine whether there is spatial overlap by considering the distance at which the ambient concentrations from a facility begin to approach background levels.	
Request **15-Apr-19**	Discuss cumulative emissions based on the distance where ambient concentrations approach background.	
Equinor Response **15-Nov-19**	Section 8.5.4 of the EIS will be updated to read as: ***"Generally, background concentrations of air contaminants in the Project Area would be low.*** Project-related releases of air contaminants and GHGs to the atmosphere, as described above, have the potential to interact and accumulate with emissions from other sources in the Project Area and beyond. ***Air quality would be occasionally influenced by transient sources as they pass the Project Area during transit.*** These ***transient sources*** include other marine vessel traffic (including fishing vessels) and exploration activities (e.g., seismic, exploration drilling). In terms of fishing, and other marine vessel traffic, the short-term and transient nature of these activities and thus their releases of CACs and GHGs to the atmosphere limits the potential for direct interaction with air quality and GHGs from the Project. ***There is also potential for the emissions from*** the operation of existing offshore production platforms ***to interact and accumulate with the Project emissions*** (see Section 5.7.1 for an overview of concentrations of CACs and GHG emissions from these facilities and their effects on ambient air quality in the region). The Project is located over 180 km from the nearest production platform (White Rose); therefore, the locations of these sources with respect to the Project makes interactions unlikely. This conclusion is supported by air dispersion modelling results for the Project: • Air quality dispersion modelling conducted for this Project, which concluded that the maximum predicted concentrations (above the CAAQS) generally occur approximately 500 m to 1,700 m from the FPSO and/or drilling installation. • ***Based on the predictive modelling completed for the Project and modelling previously completed for offshore Newfoundland and Labrador to support an Environmental Studies Research Fund (ESRF) project (Stantec 2013), predicted concentrations from offshore production activities approach background levels within 25 to 30 kms from the Project/Facility. At these distances, a cumulative overlap of concentrations from the other existing platforms with the Project is not expected.*** • ***The ESRF project (Stantec 2013) also concluded that air contaminant concentrations (in the case of NO_X) from the operation of the existing facilities (SeaRose FPSO and the Terra Nova FPSO (the Hibernia platform was not included in the study) and future facilities (the Hebron Platform) generally meet onshore ambient air quality regulations at 3 km or less from the emitting structure. Therefore, there will be no spatial overlap in air contaminant emissions from the Project with existing offshore producing operations.***	

	• GHG emissions calculated for the three Project phases each represent a small fraction to both provincial (1.6 percent to 2.4 percent) and national (0.02 percent to 0.04 percent) totals."

IR-51	**Guideline Ref: Part 2, Section 7.1.1**	**EIS Ref:** Section 8.5
NRCan-2		
Context/Rationale	Criteria Air Contaminants (CAC) emissions are typically estimated using methodologies/factors from AP-42 (https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/report/tools-calculating-emissions.html#n2). Similarly, GHG emissions are typically estimated with methodologies approved by the UNFCCC and developed by the IPCC (http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=47B640C5-1&printfullpage=true%20-%20ws800EC2BC) (https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html) (https://www.exec.gov.nl.ca/exec/occ/greenhouse-gas-data/GHG_Reporting_Guidance_Document.pdf).	
Request **15-Apr-19**	Justify the use of the Norwegian emission factors by either providing evidence to support that the result is a more conservative estimate or noting their superior certainty.	
Equinor Response **15-Nov-19**	Norwegian emission factors (EF) were developed specific to the oil and gas industries and use sources that are relatively more recent (ranging from 1993-2017), and therefore are more representative than the Environmental Protection Agency (EPA) emission factors. Emissions of GHGs are often estimated using EFs published by the IPCC. Oil and gas extraction EFs would fall into the Tier 1 IPCC EF for the energy industry. These Tier 1 IPCC EFs give one value for all usage of a specific fuel, e.g. all combustion of diesel. The Norwegian EFs break out EFs for fuel combustion by activities, e.g. turbines, engines, etc. The Norwegian GHG EFs are also based on more recent data sources. Emissions of CACs are often estimated using US EPA AP-42 EFs. The AP-42 EF inventories that would be related to the above activities were published in 1996 (diesel combustion - Chapter 3.4) and 1995 (gas flaring – Chapter 5.3) and used data sources as far back as 1959. Those related to diesel combustion are not specific to the oil and gas industry. There is a level of uncertainty when using EFs, regardless of their source, as EFs are developed from average emission data from numerous pieces of equipment which can vary in age, specifications, efficiencies, etc. The data used to develop EFs can vary in quality and quantity. As stated in the EIS, the equipment units burn diesel fuel except for the flaring, which uses produced gas. It has been assumed that the composition of produced gas is similar to that of natural gas. In Section 8.5, emission factors (EFs) from the Norwegian Oil and Gas Association (2018) reference were used for the following contaminants: • NO_X • CO • SO2 • nmVOC • CO2	

	• CH4 • N2O These emission estimates were used for the following releases: • Hook-up and commissioning (HUC) emissions: – FPSO (diesel) – drilling installation (diesel) – offshore support and supply vessels (diesel) – marine construction (diesel) • Concurrent drilling and production emissions, power options 1 and 2: – drilling installation (diesel) – offshore support and supply vessels (diesel) – shuttle tanker (diesel) – flaring (gas) • Emissions from normal production operations: – offshore support and supply vessels (diesel) – marine construction (diesel) – shuttle tanker (diesel) – flaring (gas) To assess whether using the Norwegian EFs is more conservative than using AP-42 (for CACs) EFs or IPCC (for GHGs) EFs, the EFs were converted to the same units and directly compared. When the Norwegian emission factor is higher than the AP-42/IPCC EF, it is considered a conservative estimate. These comparisons are presented below. There were two EFs from the Norwegian source that were less conservative than those in AP-42 or IPCC, CO and CH_4 from diesel combustion. However, using AP-42 or ICPP EFs opposed to the Norwegian EFs would not alter the current conclusions: • modelled CO would remain well below the ambient air quality limit - the AP-42 emission factor is only 2.3x higher than the Norwegian and the current modelled maximum concentration (using Norwegian EF) was <1% of the limit Total GHG emissions on a CO_2e basis (consisting of CO_2, CH_4 and N_2O) would be more conservative using the Norwegian factors. The Norwegian source did not present EFs for CH_4 from diesel combustion, whereas IPCC did. Despite this leading to a less conservative estimate of CH_4, the EFs of CO_2 and N_2O were conservative enough from the Norwegian source such that when converted to a total CO_2e emission, the Norwegian GHG estimates are higher. <u>Criteria Air Contaminants</u> The Norwegian CAC EFs for diesel combustion are presented as unit tonne of air contaminant per tonne of diesel fuel. The AP-42 CAC EFs for diesel combustion, presented in AP-42: "Compilation of Air Emission Factors, Chapter 3.4, Large Stationary Diesel and All Stationary Dual-fuel Engines" (US EPA 1996), are presented as unit pound (lb) of air contaminant per energy content of fuel (MMBTu). The AP-42 EFs were converted from lb/MMBtu to tonne/tonne using the higher heating value of diesel,137,000 BTU/gal, obtained from Appendix A of US EPA AP-42, the density of diesel, 0.855

tonne/m^3, obtained from Equinor, and general unit conversion from imperial to metric units. An example of the EF conversion for CO is as follows:

$$EF_{CO} = \frac{0.85\ lb}{MMBTU} x \frac{1\ MMBTU}{10^6 BTU} x \frac{137{,}000\ BTU}{1\ US\ gal} x \frac{1\ US\ gal}{3.79\ x\ 10^{-3} m^3} x \frac{1\ m^3}{0.855\ tonne} x \frac{0.4536\ kg}{1\ lb} x \frac{1\ tonn}{1000\ k}$$

$$EF_{CO} = 0.016 \frac{tonne}{tonne}$$

The emission factors from AP-42 were all converted to the same units as those presented in the Norwegian source and are presented in the following Table 1.

Carbon monoxide was the only CAC in which the Norwegian emission factor from diesel usage was not more conservative than the AP-42 emission factor. When converted to the same units, the CO emission factor from AP-42 is 2.3x higher than that from the Norwegian reference. As the modelled concentrations of CO were well below the provincial limits (<1% of the limit), switching to the higher emission factor would still result in concentrations well below the limits.

Table 1 Comparison of CAC Diesel Combustion Emission Factors from AP-42 and Norwegian

			CO	NO_X	SO_2	nmVOC
AP-42, Table 3.4-1	Diesel Oil	lb/MMBTU	0.85	1.9	0.0505	0.0819
		tonne/tonne	0.016	0.036	0.001	0.002
Norwegian Factor		tonne/tonne	0.007	0.07	0.001	0.005
Norwegian Emission Factor More Conservative?			**No**	**Yes**	**Yes**	**Yes**

In a similar way, for flaring of produced gas (assumed to have similar composition of natural gas), the EFs were compared directly because they are the same units – mass of air contaminant (grams) per volume in standard cubic meters (Sm^3).

For emissions of CACs from flaring of produced gas, Table 2 compares the Norwegian CAC emission factors used in Chapter 8.5 with the emission factors presented in AP-42: "Compilation of Air Emission Factors, Chapter 5.3, Natural Gas Processing" (US EPA 1995).

As shown in Table 2, all of the natural gas flaring CAC emission factors obtained from the Norwegian source were more conservative than those presented in AP-42.

Table 2 Comparison of CAC Flaring Emission Factors from AP-42 and Norwegian

			CO	NO_X	SO_2	nmVOC
AP-42, Table 5.3.1	Natural Gas	g/Sm3	Neg	Neg	0.0068	Neg
Norwegian Factor		g/Sm^3	1.4	1.5	0.068	0.06
Norwegian Emission Factor More Conservative?			**Yes**	**Yes**	**Yes**	**Yes**

Greenhouse Gases

For emissions of greenhouse gases (GHGs) from diesel combustion, Table 3 compares the Norwegian GHG emission factors presented in Chapter 8.5 with the GHG emissions from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.2. The ICPP emission factors being compared are the upper range, for conservatism. The Norwegian GHG emission factors were conservative with the exception of CH_4 from diesel, in which a Norwegian emission factor was not presented. Despite the CH_4 emission factor from the Norwegian source is not presented, the conservatism in the CO_2 and N_2O emission factors would result in an overall more conservative CO_2e emission rate when using the Norwegian emission factors compared to using the IPCC emission factors. This is evident when the IPCC CH_4 EF is expressed as CO_2e - using a GWP of 25, the EF expressed as CO_2e would be 0.030 tonne CO_2e/tonne, which is less than difference between the CO_2 EF from IPCC and the Norwegian source.

Table 3 Comparison of GHG Diesel Combustion Emission Factors from IPCC and Norwegian

			CO_2	CH_4	N_2O
IPCC	**Diesel Oil**	kg/TJ	74,800	30	2
		tonne/tonne	2.96	1.19E-03	7.92E-05
Norwegian Factor		tonne/tonne	3.17	NA	2.00E-04
Norwegian Emission Factor More Conservative?			**Yes**	**No**	**Yes**

For emissions of GHGs from flaring of produced gas, Table 4 compares the GHG emission factors used in Chapter 8.5 sourcing from the Norwegian Oil and Gas Association (2018) with those presented by IPCC (IPCC 2006). All Norwegian emission factors were found to be more conservative (larger).

Table 4 Comparison of GHG Flaring Emission Factors from IPCC and Norwegian

			CO_2	CH_4	N_2O
IPCC	**Natural Gas**	kg/TJ	58,300	3	0.3
		t/kSm^3	2.26	1.16E-04	1.16E-05
Norwegian Factor		t/kSm^3	2.34	9.10E-04	1.90E-05
Norwegian Emission Factor More Conservative?			**Yes**	**Yes**	**Yes**

While it was indicated at the Regulatory Review Workshop (May 2019) that the EIS would be amended to provide clarity in the EIS, based on further review of the information in the EIS, and with the comparison above, Equinor Canada is of the opinion that the EIS is complete and further updates are not required.

For clarity the following text will be added to Section 8.5 of the EIS:

> ***"Where applicable, emission factors from the Norwegian Oil and Gas Association (2018) reference are used, as identified in subsequent sections. The Norwegian emission factors were developed specific to the oil and gas industries and use sources that are relatively more recent (ranging from 1993-2017) compared to other emission factors."***

References:

Norwegian Oil and Gas Association. 2018. 044 – Recommended guidelines for discharge and emission reporting. Revision No. 16. Stavanger, Norway. Available at: https://www.norskoljeoggass.no/contentassets/cd872e74e25a4aadac1a6e820e7f5f95/044---guidelines-for-discharge-and-emission-reporting.pdf. Accessed October 2019.

US EPA. 1996. Large Stationary Diesel and All Stationary Dual-fuel Engines. US EPA, Research Triangle Park, NC. Available at: https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s04.pdf. Accessed October 2019.

	US EPA. 1995. Natural Gas Processing. US EPA, Research Triangle Park, NC. Available at: US EPA. 1996. Large Stationary Diesel and All Stationary Dual-fuel Engines. US EPA, Research Triangle Park, NC. Available at: https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s04.pdf. Accessed October 2019. IPCC. 2006. Guidelines for National Greenhouse Gas Inventories – Chapter 2: Stationary Combustion. Available at: https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf. Accessed October 2019.

IR-52 **DFO-41**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.1.1
Context/Rationale	NAFO Scientific Council (SC) provides advice on the status of NAFO-managed stocks every year, and has a working group focused on ecosystem issues and the implementation of ecosystem approaches since 2008. Both SC and its ecosystem working group have been generating ecological analyses and summaries relevant to the Project Area on a yearly basis at a minimum; these results are regularly documented in NAFO Scientific Council Summary (SCS) documents (typically meeting reports), there is also Scientific Council Research (SCR) documents which on occasion serve as a starting point for scientific primary publications. All these NAFO documents are peer-reviewed by SC and/or its ecosystem working group, and are freely available on the NAFO website (https://www.nafo.int/Library/Science/SC-Documents).	
Request **15-Apr-19**	Examine, collate and summarize all literature available from NAFO SCS and supporting documents https://www.nafo.int/Library/Science/SC-Documents) in the EIS and update the effects assessment as necessary.	
Equinor Response **15-Nov-19**	The EIS provides a description of the biological environment in the areas likely to be affected by Project activities, in this case the Project Area and the Local Study Area (LSA). This description includes consideration of various datasets including the NAFO Scientific Council Summaries and Research Documents, where applicable, respecting species and special areas. These documents are also the basis for species distribution and abundance maps for the Flemish Cap (e.g., Figures 6-6, 6-15, 6-18 of the EIS). Further information from NAFO research documents NAFO Division 3L have also been included in updates to the EIS (See response provided in IR-85/DFO-70 and IR-95/DFO-76). Information from NAFO Scientific Council Summaries and Research Documents are already considered in the effects assessment for Marine Fish and Fish Habitat. The level of information provided for describing the existing biological environment is consistent with the level of information that has been deemed acceptable by CEA Agency in the environmental assessment of other offshore oil and gas projects (e.g., EMCP 2011, 2017; Stantec Consulting 2018, Statoil 2017). Updates to the EIS are not required. References: ExxonMobil Canada Properties Ltd. 2011. Hebron Project Comprehensive Study Report. Prepared by Stantec Consulting. St. John's, NL Canada. September 2011. ExxonMobil Canada Properties Ltd. 2017. Eastern Newfoundland Offshore Exploration Drilling Project – Environmental Impact Statement. Prepared by Amec Foster Wheeler and Stantec Consulting. St. John's, NL Canada. November 2017.	

	Stantec Consulting. 2018. Newfoundland Orphan Basin Exploration Drilling Program Environmental Impact Statement. Prepared for BP Canada Energy Group ULC. Statoil. 2017. Flemish Pass Exploration Drilling Program – Environmental Impact Statement. Prepared by Amec Foster Wheeler and Stantec Consulting. St. John's, NL Canada. November 2017.

IR-53 **DFO-42**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.1.1
Context/Rationale	Section 6.1.1.1 of the EIS states that "Although the multispecies surveys have been conducted for several decades, six years of recent available data (2011 to 2016) were synthesized in this summary as the Northwest Atlantic's ecosystem has experienced ecological shifts and remains in a state of flux (Dawe et al. 2012; Nogueira et al. 2016, 2017*)".* This contracted time period of six years can be considered insufficient to examine species shifts and oceanographic patterns in the context of ecological shifts.	
Request **15-Apr-19**	Re-evaluate Section 6.1.1.1 using more of the 'several-decade-long time series data' available for completeness and update the effects assessment as necessary.	
Equinor Response **2-May-19**	Equinor Canada responded to this IR in May 2019. The following information was provided: *Consistent with recent drilling EIS reports (Equinor 2017, Nexen 2018, ExxonMobil 2017) the same timeline was used and follow-up information was not requested. Using the last few years of data has been sufficient for previous environmental assessments to indicate dominant species in the area.*	
DFO Response **10-Jun-19**	Equinor's response does not sufficiently address the IR. Given that there are considerable differences between production and exploration drilling projects (e.g. duration, waste discharges), the use of comparable (i.e. short time period) baseline information is inadequate.	
Equinor Response **15-Nov-19**	The EIS guidelines do not provide any guidance for the timeframe over which historical data should be selected. However, the EIS Guidelines state (Section 4.3): "Except where specified by the Agency, the proponent has the discretion to select the most appropriate methods to compile and present data, information and analysis in the EIS as long as they are justifiable and replicable." Based on this, the EIS team used their professional judgement and experience to scope the baseline data. The approach used in describing baseline fisheries in the BdN EIS was consistent with the recent exploration drilling environmental assessment, including the recently approved Flemish Pass Drilling EIS (Statoil 2017). It is also very similar to the approach used in the Hebron Project EIS, where RV data from 2007-2010 (a 4-yr period) were used to provide baseline data of fisheries resources. Additionally, if a multi-decadal time series were to be used, it would also have to account for the various methods used (different trawl types/fishing times). The data used in the EIS are to provide species distribution and presence in the area on which to base an assessment, not to provide an estimate of natural variability in the area. While it is understood that the ecosystem is changing, it is Equinor Canada's opinion that the information provided in an EIS is sufficient to make impact predictions for a development project.	

IR-54 **DFO-141**	**Guideline Ref:** Part 2, Section 7.1.9.2	**EIS Ref:** Section 6.1.1.1
Context/Rationale	The research vessel survey programs of Spain in both Div. 3L and Divs. 3NO should also be detailed in Section 6.1.1.2 of the EIS. Results from 3L are likely pertinent to the Project.	
Request **15-Apr-19**	In Section 6.1.1.2 of the EIS include information from Spain's research vessel survey programs in the EIS and update the effects assessment as necessary.	
Equinor Response **15-Nov-19**	The following text in Section 6.1.1.2 of the EIS will be amended to read: "These data have been used to characterize fish assemblages in the region for the years 2004 to 2013 (based on some 1,699 trawls) by Nogueira et al. (2016, 2017). ***Randomly stratified trawl surveys have also been conducted in NAFO Division 3L in the Flemish Pass by Spain since 2003 (1,261 valid hauls from 2003-2017) (e.g., Román et al. 2018a, 2018b). Full surveys sampling in all strata have been conducted since 2006 with available information in published reports for specific groundfish species (e.g., Greenland halibut, Atlantic cod, American plaice, witch flounder, roughhead grenadier, black dogfish, thorny skate, redfish) (Román et al. 2018a, 2018b).***" Furthermore, in responses to IR-85/DFO-70 and IR-95/DFO-76, additional information will be added to Section 6.1.8.5 regarding Atlantic cod and redfish using EU RV surveys. Additional information regarding these species does not change the overall environmental description nor the effects assessment. References: ***Román, E., González-Troncoso, D., and M. Alvarez. 2018a. Results for the Atlantic cod, roughhead grenadier, redfish, thorny skate and black dogfish of the Spanish Survey in the NAFO Div. 3L for the period 2003-2017. Northwest Atlantic Fisheries Organization Scientific Council Research Document. 18/018. Serial No. N6802.*** ***Román, E., González-Iglesias, C. and D. González-Troncoso. 2018b. Results for the Spanish Survey in the NAFO Regulatory Area Division 3L for the period 2003-2017. Northwest Atlantic Fisheries Organization Scientific Council Research Document. 18/019. Serial No. N6803.***	

IR-55 **DFO-43**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.1.5
Context/Rationale	Section 6.1.1.5 in the EIS states "No key information gaps have been identified"; however, a seabed survey may be carried out if design changes. It is not clear how impacts of a design change will be assessed or the necessity of a seabed survey will be determined.	
Request **15-Apr-19**	Explain the process for establishing future seabed surveys.	
Equinor Response **15-Nov-19**	As stated in response to IR-101/Conformity DFO-3 the following text will be added to Section 6.1.1.5 – Seabed Survey. "…Equinor Canada completed a seabed survey in representative locations (**Error! Reference source not found.**). The areas chosen were based on the currently proposed subsea layout. ***Upon completion of final subsea layout design, the area occupied by the final layout design will be compared against the layout used in***	

	the 2018 survey. Based on the final design, if there are areas where subsea infrastructure will be installed on the seafloor that were not captured by the 2018 survey, these areas will be surveyed to collect coral, sponge and/or sea pens data."

IR-56	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.2
DFO-44		
Context/Rationale	No reference is provided for the EIS statement in Section 6.1.2 *"*As a consequence of the groundfish stock collapse in the 1990s, there was an increase in the abundance of their prey including pelagic fish (e.g., sand lance, herring) and invertebrates (e.g., shrimp, snow crab)." This information is important to describe the existing state of the offshore ecosystem and important foodwebs interactions.	
Request **15-Apr-19**	In Section 6.1.2 provide supporting documentation regarding the increase in pelagic prey after the groundfish collapse.	
Equinor Response **15-Nov-19**	The text in Section 6.1.2 of the EIS will be amended to read as: "As a consequence of the groundfish stock collapse in the 1990s, there was an increase in the abundance of their prey including pelagic fish (e.g., sand lance, herring) and invertebrates (e.g., shrimp, snow crab) ***(deYoung et al. 2004; Koen-Alonso et al. 2010; Dawe et al. 2012).***" References: Dawe, E.G., Koen-Alonso, M., Chabot, D., Stansbury, D., and Mullowney, D. (2012). Trophic interactions between key predatory fishes and crustaceans: Comparison of two Northwest Atlantic systems during a period of ecosystem change. Marine Ecology Progress Series. 469:233-248. deYoung, B., Harris, R., Alheit, J., Beaugrand, G., Mantua, N., and Shannon, L. (2004). Detecting regime shifts in the ocean: Data considerations. 60(2-4): 143-164. Koen-Alonso M., Pepin, P., and Mowbray, F. (2010). Exploring the role of environmental and anthropogenic drivers in the trajectories of core fish species of the Newfoundland and Labrador marine community. NAFO Scientific Council Research Document. 10/37. 16 pp.	

IR-57	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.3
DFO-45		
Context/Rationale	While Section 6.1.3 of the EIS mentions habitat complexity, and uses biogenic habitats like coral and sponge aggregations as examples, it does not mention that some of these habitats have been already delineated both by DFO (DFO 2017a, actually cited as "DFO 2017k" in Chapter 6) and NAFO (NAFO 2016). The text also does not explain how change in the integrity of these habitats (or lack thereof) may potentially impact ecological processes.	
Request **15-Apr-19**	Refer to DFO 2017a, DFO 2017b, and NAFO 2016 for useful sources, and guidelines on how to consider protection for these habitats to avoid serious or irreversible harm. Update effects assessment as necessary.	

Equinor Response 15-Nov-19	Discussion on sponge and coral function and ecological role is described in Section 6.1.3 (and includes reference to DFO 2017b as highlighted in the reviewer's comment) and Section 6.1.7.6 of the EIS. The delineation and description of these habitats are described in Section 6.4.4.2 and Section 6.4.4.3, which includes reference to DFO 2017a and NAFO 2016. Chapter 9 provides an effects assessment of Project Activities on Marine Fish and Fish Habitat including corals and sponges (e.g., Section 9.2.3). Further information on interactions are addressed through clarification of ecosystem linkages provided in response to IR-32/Conformity DFO-1 Mitigation measures to prevent or reduce adverse effects from routine activities on Marine Fish and Fish Habitat including corals and sponges are listed in Section 9.1.5.2 and have been included in the effects assessment. Additional information regarding mitigations is provided in response to IR-101/Conformity DFO-3. Updates to the EIS are not required.

IR-58	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.5.1, Page 6-15
DFO-137		
Context/Rationale	Statement including *"…distributions of temperate species may increase…"* needs clarification of which temperate species are being described.	
Request 15-Apr-19	Identify the temperate species in Section 6.1.5.1 of the EIS.	
Equinor Response 15-Nov-19	Sundby et al. (2016) discusses the change in distribution of *Calanus finmarchicus* and *C. helogolandicus.* The text in Section 6.1.5.1 will be amended to read as: "However, as ocean temperatures rise, the northern extent of the distributions of temperate species ***Calanus finmarchicus*** **and** ***C. helogolandicus*** may increase (Sundby et al. 2016)."	

IR-59	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.5.1
DFO-45		
Context/Rationale	Section 6.1.5.1 of the EIS uses the word "*phenomenon*" in reference to poor stock condition for herring in the North Sea. This information is important to clearly understand the existing environment in the assessment of effects.	
Request 15-Apr-19	For section 6.1.5.1 of the EIS clarify whether the phenomenon of poor stock condition for herring in the North Sea is the match-mismatch between the stock and the spring bloom and how that situation relates to the project area.	
Equinor Response 15-Nov-19	The seasonal patterns of phytoplankton abundance and distribution for the Project Area are described in 6.1.5.1 and includes a discussion of potential effects on higher trophic levels including examples from the Northwest Atlantic. This information provides context for the existing environment in the Project Area and surrounding region. For clarification, the text in EIS in Section 6.1.5.1 will be amended to read as: "The ***match-mismatch*** ~~phenomenon~~ ***between the stock and the timing of the*** ~~with the~~ ***spring bloom*** has also been associated with poor stock condition for herring in the North Sea (Illing et al. 2016) and for Atlantic cod (Minto et al. 2014), Atlantic	

	mackerel (Plourde et al. 2015) and northern capelin (Mullowney et al. 2016) in the Northwest Atlantic."

IR-60 **DFO-30**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.6
Context/Rationale	In Table 6.2 in Section 6.1.6 of the EIS, the All Survey Years column is not always consistent with Pre-2003 and Post-2003 columns. For example, the All Survey Years value for *Illex illecebrosus* is higher than values for the other two columns. If inconsistencies are due to an error, revision is required.	
Request **15-Apr-19**	Revise Table 6.2 in Section 6.1.6 of the EIS between pre-2003 and post-2003 data in the All Survey Years column, as applicable, for consistency.	
Equinor Response **15-Nov-19**	As discussed in Section 6.1.6 of the EIS, Vázquez et al. (2013) compiled the percentage of hauls with occurrence of each species or group of pelagic macroinvertebrates (no biomass, seasonal timing or locations were provided) from the Flemish Cap (1977-2012). As indicated by Vázquez et al. (2014), the benthic trawl surveys conducted during this period were not standardized as they were conducted as separate programs either by Canada or the European Union. For example, depth of the surveys was limited to 730 m until 2003, after which the maximum depth of the surveying was increased to 1,460 m (Vázquez et al. 2013). Table 6.2 is a summary of these data for prevalent macroinvertebrates that feed in the pelagic environment. The columns for "Pre-2003, ≤730 m depth (24 years)" and "Post-2003, ≤1460 m depth (10 years)" are percentages of the "All Survey Years (34 years)" where the species was observed. For example, *Illex illecebrosus* was observed in 82 percent (28 trawls) of all trawls across a 34 year period. Within the trawls where the *Illex. illecebrosus* was observed, 64 percent of survey years (18 of 28 trawls) was Pre-2003 at ≤730 m depth and 36 percent of survey years (10 of 28 trawls) was Post-2003 at ≤1,460 m depth. Calculation of the percentage of survey years where the species was observed provides an indication of which trawl depth categories contributed to observations across survey years. Table 6.2 of the EIS will be amended to read as:	

Table 6.2 Summary of Prevalent Species of Macroinvertebrates that Feed in the Pelagic Environment Sampled Around the Flemish Cap in Canadian and EU Surveys (1977 to 2012)

Phylum, Class (Order)	**Common Name**	**Scientific Name**	***"Species Observed Survey Years (34 Years)"***		**Proportion of Observed Survey Years (%)**[1]	
			"Yrs"	**%**	**Pre-2003, ≤730 m depth**	**Post-2003, ≤1460 m depth**
Mollusca, Cephalopoda	Squid	*Illex illecebrosus*	***28***	82	64	36
	Squid	*Histioteuthis reversa*	***21***	62	67	33
	Squid	*Semirossia* sp.	***19***	56	74	26
	Squid	*Histioteuthis* sp.	***13***	38	46	54
	Squid	*Histioteuthis bonnellii*	***10***	29	10	90

	Squid	*Gonatus fabricii*	***10***	29	10	90
	Squid	*Onychoteuthis banksii*	***9***	26	89	11
	Octopus	*Bathypolypus arcticus*	***26***	76	65	35
Arthropoda, Crustacea (Decapoda)	Shrimp	*Pandalus borealis*	***27***	79	63	37
	Shrimp	*Acanthephyra pelagica*	***20***	59	50	50
	Shrimp	*Pasiphaea tarda*	***19***	56	47	53
	Shrimp	*Eusergestes arcticus*	***17***	50	41	59
	Shrimp	*Sergia robusta*	***17***	50	41	59
	Shrimp	*Parapasiphae sulcatifrons*	***15***	44	33	67
	Shrimp	*Sabinea sarsii*	***15***	44	40	60
	Shrimp	*Sabinea hystrix*	***15***	44	33	67
	Shrimp	*Atlantopandalus propinqvus*	***12***	35	17	83
	Shrimp	*Pontophilus norvegicus*	***12***	35	17	83
	Shrimp	*Acanthephyra* sp.	***11***	32	36	64
	Shrimp	*Acanthephyra purpurea*	***11***	32	9	91
	Shrimp	*Spirontocaris liljeborgii*	***10***	29	60	40
	Shrimp	*Lebbeus polaris*	***10***	29	20	80
Arthropoda, Malacostraca (Mysida)	Mysid Shrimp	unidentified	***9***	26	0	100
Cnidaria, Scyphozoa	Jellyfish	unidentified	***11***	32	9	91

Source: Data compiled from Vázquez et al. (2013)
[1] ***Pre-2003 trawls included 24 survey years and Post-2003 trawls included 10 survey years***

IR-61	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.3
DFO-138		
Context/Rationale	Table 6.6 in Section 6.1.7.3 of the EIS notes a distinct change in the density of sponges at the depth range 1000 to 1300 metres. DFO believes this may be incorrect. This information is important to understand the existing environment.	
Request **15-Apr-19**	Ensure the data presented in Table 6.6 of Section 6.1.7.3 of the EIS supports the statement related to change in density of sponges relate to depth ranges 1000 to 1300 metres.	
Equinor Response **15-Nov-19**	The data presented in Table 6.6 are based on Beazley et al. (2013). The information presented provides information to characterize invertebrate communities in the Flemish Pass based on photographic surveys. Beazley et al. (2013) indicated that within their survey "The most distinct faunal transition occurred somewhere between ~1000 and ~1300 m with the community below 1300 m being markedly different from that shallower than 1000 m." The text in Section 6.1.7.3 of the EIS will be amended to read as: "In the Flemish Pass, ~~this is shown by the shift in~~ ***Beazley et al. (2013a) observed a similar trend*** in benthic communities at the depth range 1,000-1,300 m where there is a distinct change in the density of sponges."	

IR-62 **DFO-49**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.4, Table 6.8
Context/Rationale	Table 6.8 in Section 6.1.7.4 does not clearly depict dominance of invertebrate species. This information is needed to understand the marine fauna and communities in order to assess environmental effects by the Project.	
Request **15-Apr-19**	Explain how dominance of invertebrate species was inferred for information presented in Table 6.8 in Section 6.1.7.4 of the EIS.	
Equinor Response **15-Nov-19**	Carter et al. (1979) characterized sediments and benthos in parts of the Orphan Basin using a series of Van Veen sediment grabs and seabed photographs. No abundance or density data were provided in the paper to specifically support identification of characteristic species. Table 6.8 identifies characteristic macrofauna of each depth zone sampled as described by Carter et al. (1979). Characteristic species were interpreted to be dominant species as observed from Van Veen sediment grabs and seabed photographs. The EIS is complete. Updates to the EIS are not required.	

IR-63 **DFO-3**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Page 6-57, Table 6.17
Context/Rationale	The EIS Guidelines require a description of sensitive features (e.g., corals and sponges), and the potential requirement of a benthic habitat survey. Based on Table 6.17, more than half of the sponge species observed during the 2018 Equinor Canada Seabed Survey could not be identified. This information is needed to assess environmental effects by the Project on marine communities.	
Request **15-Apr-19**	A. Describe challenges encountered for sponge identification. B. Describe whether modification to the survey or data processing could improve sponge identification.	
Equinor Response **2-May-19**	Equinor Canada responded to this IR in May 2019. The following information was provided: *This information is a clarification only. The EIS would not require an update.* *Wood, the primary EIS contractor, indicates that It has been indicated by DFO to be cautious in identification of corals and sponges without collected specimens as it requires a taxonomist assessment or DNA sequencing to identify to species. The seabed survey did not collect specimens; it was a visual survey only.* Updates to the EIS are not required.	
DFO Response **10-June-19**	Response is adequate.	

IR-64 **DFO-48** **DFO-58**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.5, Section 6.1.7.6
Context/Rationale	The methodology section contains tables listing communication timelines, but details on methodology accepted by DFO is lacking.	

	To reiterate the DFO 2018 Science Response, NOROG Guidelines (DVR, 2013) or best practices approach for industry are not current nor relevant for the benthic communities found in the Project Area. It appears these guidelines are still being referenced and the guidelines used for the 2018 surveys are not clear (e.g., coral spp./m2, height of coral > 30 cm, functional group, etc.). Regarding Equinor's seabed survey information in Section 6.1.7.6 in the EIS, it is not clear how images were selected for analysis. Table 6.12 provides species observed, but identifications are questionable. There are two species of *Anthoptilum* that cannot be determined from imagery, unless close inspection of base of polyps. Even more challenging is the identification of *Alcyoniina* spp. with up to six species of Alcyoniidae known in the region (including the Project Area), none of which can be separated from a top only view. There are six other species of Nephtheidae soft corals known in the region, which are not necessarily restricted to hard substrates as mentioned throughout the EIS (e.g. *Gersemia fruticosa* can be found living directly on soft bottoms). AUV surveys were flown about four metres off sea bed. Sea pen fields are dominated by *Pennatula* spp. like *P. aculata* of which adults can reach 30 cm in height with up to 10 cm of that buried in the mud. At four metres distance, many smaller habitat-forming sea pens would not be seen, especially recruits for determining recovery rates. Therefore, total abundance numbers provided here are most likely underestimated (see Table 6.12). In the past, NOROG guidelines incorporated height as a deciding factor in survey guidelines (i.e. sea pen colonies <30 cm were not noted; see DFO 2018). It is not clear whether a similar approach was used for Equinor's Survey. This information is needed to clearly understand species presence to describe the benthic community in order to assess environmental effects of the Project.
Request **15-Apr-19**	A. In Section 6.1.7 of the EIS describe methodology accepted by DFO (e.g., were NOROG Guidelines used?). B. Cordes et al., 2016 includes relevant literature that could be used to supplement areas not covered under the NOROG Guidelines. C. In Section 6.1.7.6 of the EIS, describe how seabed survey images were selected for analysis (e.g., random). D. Ensure accuracy of taxonomic identification in Table 6.12 of the EIS. DFO requests access to video data to verify species identified to date and are willing to process remaining video. E. Describe the guidelines used for the 2018 ROV/AUV surveys (recommendations for surveys are provided in Annex 5).
Equinor Response **2-May-19**	The original IR in April was only Part A. This is the response Equinor Canada provided to Part A. *The methodology used in the Seabed survey was provided to DFO in July, 2018. A coral and sponge survey plan was submitted to DFO for review / approval prior to conducting the survey (reference emails K. Coady to K. Keats, 6-Jul-18). Comments were provided by DFO on 27-Jul-18 (email K. Keats to K. Coady). Equinor responded to the comments on 31-Jul-18 (email K. Coady to K. Keats). DFO indicated on 1-Aug-18, that nothing further was required (email K. Keats to K. Coady). This correspondence is noted in Table 3.1 in Chapter 3. EIS Section 6.1.1.5 states that*

	"The 2018 survey methodology was reviewed and accepted by the C-NLOPB and DFO prior to commencement."
DFO Response 10-Jun-19	Equinor's response does not sufficiently address the IR for DFO to assess if the proponent adhered to the methodology as presented in July 2018. Groundtruthing was a component of the survey and the methods and results from groundtruthing were not described in the EIS. Additional details on survey methodology reviewed by DFO should be provided in the EIS.
Equinor Response 15-Nov-19	A. (and E) The 2018 Survey methodology information was provided to DFO in 2018. The survey report, which will be submitted to C-NLOPB and DFO upon completion, will include a discussion of the methodology, including ground truthing, employed during survey activities. For completeness, the 2018 Seabed Survey Methodology Report will be appended to the EIS. It is included as Appendix D to this Response Document. B. Cordes et al. 2016 and references therein are referenced throughout Chapter 6 and Chapter 9 of the EIS (e.g. Section 6.1.7, Section 9.2.1). As a review, this article covers literature from oil and gas operations in tropical and temperate regions. Similar literature sources regarding sponges and corals have already been incorporated into the EIS (e.g., Jarnegren et al. 2016, Purser 2016, Edge et al. 2016). C. As described in Section 6.1.1.5, seabed images from the AUV camera were randomly selected within target sections (e.g., flow line, drill center) for analysis. Image units were selected as 100 photos for analysis of approximately 60 m sections. The AUV takes continuous images along the survey transect. Images were selected to avoid overlap among AUV imagery. D. As per comments from regulatory agencies, functional groups will be used to refer to corals and sponges (See response to IR-6/DFO-3 and IR-70/DFO-56). Table 6-12 will be removed from the EIS. Table 6-11 has been updated to include functional groups (See Appendix 9 to this Response Document). DFO will be provided with a copy of the images (ROV video/AUV still images) when the 2018 Bay du Nord Seabed Survey Coral and Sponge Report is submitted for review. E. See response to Part A, above.

IR-65 **DFO-51**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.5, Table 6.69
Context/Rationale	Section 6.1.7.5 of the EIS makes several references to low habitat complexity in mud dominated ecosystems, despite habitat-forming species being observed in high abundance in the surveyed areas. For example, on Page 6-36. "Very little habitat complexity was observed along the transects." Habitat complexity is a relative term when comparing soft vs hard substrate ecosystems. It is referring to substrate only and not accounting for large scale habitat-forming species (e.g. *Pennatula* fields, *Acanella* fields, and *Keratoisis* thickets). Given that *Astrophoridae* sponges (*Geodia* spp., *Stryphnus*, *Stelletta sp.*) and sea pen fields (*Pennatula spp*), dominate the area (e.g., sea pen fields or Geodia sponge fields are the primary sources of habitat complexity in mud dominated systems like the Flemish Pass), they should be considered an important source of habitat complexity. This community is recognized by the Proponent on Page 6-275, where it states "Sea pens are	

	key biophysical components of soft-bottom VME indicator elements in the NAFO regulatory area. Aggregations of sea pens, known as "fields", provide important structure in low-relief sand and mud habitats where there is little physical habitat complexity. Fields provide refuge for small planktonic and benthic invertebrates that may be preyed upon by fish."
Request 15-Apr-19	Revise the discussion of habitat complexity throughout the EIS to ensure appropriate habitat-forming species are included.
Equinor Response 15-Nov-19	See response provided in IR-67/DFO-52 and IR-69/DFO-55. Discussion on sponge and coral function and their ecological role is described in Section 6.1.3 and Section 6.1.7.6 of the EIS. As stated in Section 6.1.7.6: "Habitat complexity in deep-sea environments is highly dependent on habitat-forming organisms, including corals, sea pens, and sponges (DFO 2015a, 2017d), which has direct and indirect influences on fish and invertebrate abundance and occurrence. The living habitat created by these long-lived and slow growing organisms are important refuges (Edinger et al. 2007; WG-EAFM 2008; Wareham 2009; Baker et al. 2012b; Baillon et al. 2014a), nursery areas (Baillon et al. 2012; Beazley et al. 2013a; DFO 2015a), and foraging areas (Baker et al. 2012b; DFO 2015a) for many fish and invertebrate species." "Sea pens in the Core BdN Development Area did not form dense aggregations (sea pen fields) as have been observed in other areas of the Grand Banks. Baker et al. (2012b) observed up to 622 *Pennatula* sp. individuals per 10 m transect in the Desbarre Canyon (southern Grand Banks) whereas the highest density for the seabed survey was approximately 12 individuals per 10 m transect." "Bamboo corals (e.g., *Keratoisis* sp., *Acanella* sp.) are large gorgonian corals that have been documented in the Flemish Pass. *Acanella arbuscula* can form large coral fields in soft substrates (Beazley et al. 2013b; NAFO 2013, 2016a). *Keratoisis* sp. colonies that have been observed to reach more than 1 m height regionally (Baker et al. 2012b; Beazley et al. 2013b) and have been associated with various sponge species (Dinn and Leys 2018)." The delineation and description of these habitats are described in Section 6.4.4.2 and Section 6.4.4.3 (Special Areas). This includes VMEs delineated for protection of coral and sponge resources. The effects assessment, as presented in Chapter 9, includes habitat forming species. Specifically, as stated in Section 9.2.3.2 of the EIS "For the Project, there is potential for interactions with habitat forming coral and sponges that occur in the Core BdN Development Area including soft corals, sea pens, glass sponges, and demosponges (Section 6.1.7.6). However, based on the modelling results, the potential interaction with these species would be limited to within 200 m from the wellsite." Updates to the EIS are not required.

IR-66 **DFO-50**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.6
Context/Rationale	Section 6.1.7.6 of the EIS refers to the Deepwater Horizon (DWH) spill. This event was a large scale marine disaster, and provides valuable information on the effects of oil spills on benthic ecosystems. Corals in the vicinity of the DWH spill were studied prior to the accident and provide a unique opportunity. As a result, there are relevant papers that should be incorporated into this EIS, including:	

	• Baguley et al. 2015 • Fisher et al. 2014 • Hsing et al. 2013 • Hourigan et al. 2017 • Silva et al. 2016
Request 15-Apr-19	In Section 6.1.7.6 of the EIS use the information provided in the following papers Baguley et al. 2015; Fisher et al. 2014; Hsing et al. 2013; Hourigan et al. 2017; and Silva et al. 2016 to substantiate the environmental effects analysis statements of effects from a large oil spill.
Equinor Response 15-Nov-19	Chapter 6 of the EIS is a description of the existing biological environment within the Project and study areas. Chapter 16 provides an assessment of the effects of accidental events on the EIS VCs. Specifically, Section 16.7.4 provides an analysis of the effects of accidental events on Fish and Fish Habitat. The references provided by the reviewer - Fisher et al. (2014), Hsing et al. (2013), and Hourigan et al. (2017) - are cited in Section 16.7.4.3 of the EIS in relation to the effects of hydrocarbons on corals. In consideration of Baguley et al. (2015), Section 16.7.4.3 - Invertebrates will be amended to include the following text: "For example, severe reductions in benthic invertebrate abundance (-30.2 percent) and community diversity (-38.3 percent) was observed up to 3 km from the Macondo well, with moderate effects (invertebrate abundance: 17.6 percent and diversity: -4.5 percent) ***observed*** up to 17 km from the well (Montagna et al. 2013, Buskey et al. 2016). ***Baguley et al. (2015) measured meiofaunal (i.e., small benthic invertebrates) abundance, diversity, and nematode to copepod ratio with distance from the DWH wellhead as indicators of change. It was found that nematode diversity increased significantly near the wellhead which may have been due to the organic enrichment. Conversely copepod abundance decreased, which may have been due to hydrocarbon toxicity (Montagna et al. 2013; Baguley et al. 2015). Based on nematode to copepod ratios, hydrocarbon effects on meiofauna were estimated to occur over approximately 310 km² around the wellhead with patchy effects observed up to 45 km (Montagna et al. 2013; Baguley et al. 2015; Cordes et al 2016)."*** In consideration of Silva et al. (2015), Section 16.7.4.3 will be amended to include the following text. "Similarly, 86 percent of corals showed signs of injuries that included brown flocculent patches at a location 11 km southwest of DWH eight months after the spill (Hourigan et al. 2017). ***Most of the research associated with DWH and corals has focused on deep sea coral reefs, but mesophotic reefs (65-90 m depth) were also studied in terms of DWH effects (Hourigan et al. 2017; Silva et al. 2015). Six sites with mesophotic reefs around 100 km from DWH spill site were observed and sampled via remotely operated vehicle (ROV) (Silva et al 2015). Detectable petroleum hydrocarbons were found in corals and visual stress indicators ranging from biofilms covering the sea fan branches (most common indicator) to bare coral skeletons and broken branches (uncommon) (Silva et al 2015)***." References: ***Baguley, J., Montagna, P., Cooksey, C., Hyland, J., Bang, H., Morrison, C., and Ricci, M. 2015. Community response of deep-sea soft-sediment metazoan meiofauna to***

	the Deepwater Horizon blowout and oil spill. Marine Ecology Progress Series 528: 127–140. ***Silva, M., Etnoyer, P.J., and MacDonald, I.R. 2016. Coral injuries observed at mesophotic reefs after the Deepwater Horizon oil discharge. Deep Sea Research Part II: Topical Studies in Oceanography, 129, 96-107.***

IR-67 **DFO-52**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.5
Context/Rationale	Tables in Section 6.2.7.5 of the EIS for Baccalieu F-89 wellsite are inadequate as they do not provide information on size class structure, patchiness, and relative abundance. At the Baccalieu Wellsite, sea pens contribute 76% of the survey. Halipteris sea pens can grow to >1 m in height and form concentrations referred to as fields. Similarly, Anthoptilum sea pens can reach >0.7 m and are shown to act as nurseries for redfish larvae, a dominant commercial fish species for the area. The presence or absence of coral, sponge and or sea pen aggregations within previous exploration well sites that were also located in a Special Area is important for cumulative effects assessment with the Project well head template locations in the Core BdN Development Area.	
Request **15-Apr-19**	A. Include 'Habitat Maps' illustrating community structure and abundance per wellsite to show proximity of large concentrations (Geodia sponge and sea pen communities) in relation to wellsites and dispersion of drill wastes. B. Discuss the importance of sea pens at the Baccalieu site (within NAFO Closure 10) and how it relates to the effects assessment.	
Equinor Response **15-Nov-19**	A. The EIS contains coral maps from available Canadian (2005-2015) and EU RV Data (2002-2013) (Figure 6-8 to 6-11) and provides indication of presence of various coral groups within the Project Area and Core Bay du Nord (BdN) Development Area. Existing figures provide an inset of coral distribution that focuses on the Project area and Core BdN Development Area (e.g., Figure 6.8). The scale is appropriate considering the data resolution and that Project design is ongoing. Survey data from the 2016 exploration wellsite Baccalieu F-89 is included in Section 6.1.7.5 of the EIS and is based on pre-spud surveys. The quality of video and resolution of data do not allow for creation of habitat maps to illustrate community structure and abundance per wellsite. Coral and sponge tentative identifications to species are based on visual characteristics. Type specimens were not collected during the pre-spud surveys. Table 6.9 will be amended to include the following footnote for clarity that identifications were based on visual surveys: ***"Tentative identifications based on visual ROV survey."*** The 2018 seabed survey as described in the EIS (Section 6.1.1.5) provide a better dataset for assessing coral and sponge densities in the Core BdN Development Area. The survey report for the 2018 seabed survey will be provided to Fisheries and Oceans Canada (DFO) when completed. As the survey did not collect type specimens for species identification, figures and analysis will be based on coral and sponge functional groups. The figures will also illustrate surficial substrates in the survey area.	

	As described in response to IR-126/CEAA-56 additional information regarding corals and sponges will be included in the EIS. The information presented is to provide an indication of presence of species for the purposes of environmental assessment. Environmental assessments are a planning tool to support detail project design and provide an overall determination of significance should a project proceed. The information contained in the EIS provides a general indication of presence of benthic habitat (i.e., sponges, sea pens and corals) in the project area on which to base the environmental assessment. The existing level of detail regarding the biological environment, as presented in the EIS, is sufficient to allow a determination of significance based on Project design. B. NAFO Fisheries Closure Areas including NAFO Northwest Flemish Cap Closure 10 is described in Section 6.4.4.3 of the EIS and includes a description of the closure area and important biological features including sea pens. The rationale for identification / designation for NAFO Closure 10 (and Closures 7, 8, 9, 11, and 12) as described in Table 6.69 is that: “Together identified as NAFO Coral Closures, these areas are closed to protect high sponge and coral concentrations. Sea pens are key biophysical components of soft-bottom VME indicator elements in the NAFO regulatory area. Aggregations of sea pens, known as “fields”, provide important structure in low-relief sand and mud habitats where there is little physical habitat complexity. Fields provide refuge for small planktonic and benthic invertebrates that may be preyed upon by fish. A system of sea pen VME indicator species has been identified extending around the edge of the Flemish Cap.” Corals, including sea pens, are also specifically considered as part of the effects assessments (e.g. Section 9.2.1.1, 9.2.3.2). Special areas, including NAFO Northwest Flemish Cap Closure 10, are assessed in Chapter 12.

IR-68 **DFO-53**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.5, Table 6.69
Context/Rationale	Section 6.1.7.5 of the EIS comments that P4b had the highest sea pen (Pennatula spp.) abundance and is located east and down current from other proposed sites (see Figure 5.6). Based on its locality, this concentration could be at risk, for example, if a flow line breaks. This information is required to describe the existing environment in order to understand changes to that community and fully assess effects from the Project.	
Request **15-Apr-19**	Verify that the effects assessment adequately captures potential impacts on this large concentration of sea pens.	
Equinor Response **15-Nov-19**	Data were presented in Section 6.1.7.5 of the EIS from the 2018 Equinor Canada Seabed Survey. As noted in the Section 6.4.4.3 of the EIS, sea pens (Pennatulacea) were the dominant coral functional group observed in survey area P4b that lies within fisheries closure area Northwest Flemish Cap (10), which is closed to protect high concentrations of corals and sponges as described in the Chapter 12. The defining features of this closure area include the presence of sea pens and indicator elements of sea pen aggregations (e.g., presence of crinoids, cerianthids, black corals). Section 12.2 and 12.3 of the EIS provides an effects assessment of all special areas. Chapter 16 assesses accidental hydrocarbon release events including modelling of an extremely unlikely worst-	

	case blowout in the FCA. Section 16.7.4.3 provides information on the effects of hydrocarbon exposure on Marine Fish and Fish Habitat, including corals. The assessment of effects on Marine Fish and Fish Habitat (Section 16.7.4.6 of the EIS) and Special Areas (Section 16.7.7.3 of the EIS) is presented based on the worst-case accidental event scenarios identified in the EIS. Therefore, the effects on sea pens and associated special areas have been fully considered and assessed within the EIS. The EIS is complete. Updates to the EIS are not required.

IR-69 **DFO-55**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.6
Context/Rationale	NAFO Working Group Ecosystem Science Assessment (WGESA) work focused on catch weights to identify important sponge concentrations. In order to see these areas, catch distribution model polygons should be added in Section 6.1.7.6 of the EIS to relevant maps to highlight these important areas. Models are designed to work with catch weights (see NAFO WGESA work 2008-2017).	
Request **15-Apr-19**	Incorporate catch distribution model polygons to appropriate figures in Section 6.1.7.6 of the EIS.	
Equinor Response **15-Nov-19**	Information regarding significant sponge catch polygons from WGESA documents will be included in Section 6.1.7.6 of the EIS. In addition, Figure 6-13 will be replaced with the amended figure below. The amended text will read as: "The EU RV dataset also shows a relatively uniform distribution of sponges throughout the vicinity of the Project Area (Figure 6-13) in the Flemish Pass and on the slopes. ***Areas of significant sponge catch (≥75 kg per tow; NAFO 2017) are shown in Figure 6-13, with two areas shown inside the Project Area."*** The addition of this information will not result in changes to the conclusions of the EIS. References: NAFO (Northwest Atlantic Fisheries Organization). 2017. Report of the 10th Meeting of the NAFO Scientific Council Working Group on Ecosystem Science and Assessment (WG-ESA). Serial No N6774, NAFO SCS Doc. 17/21.	

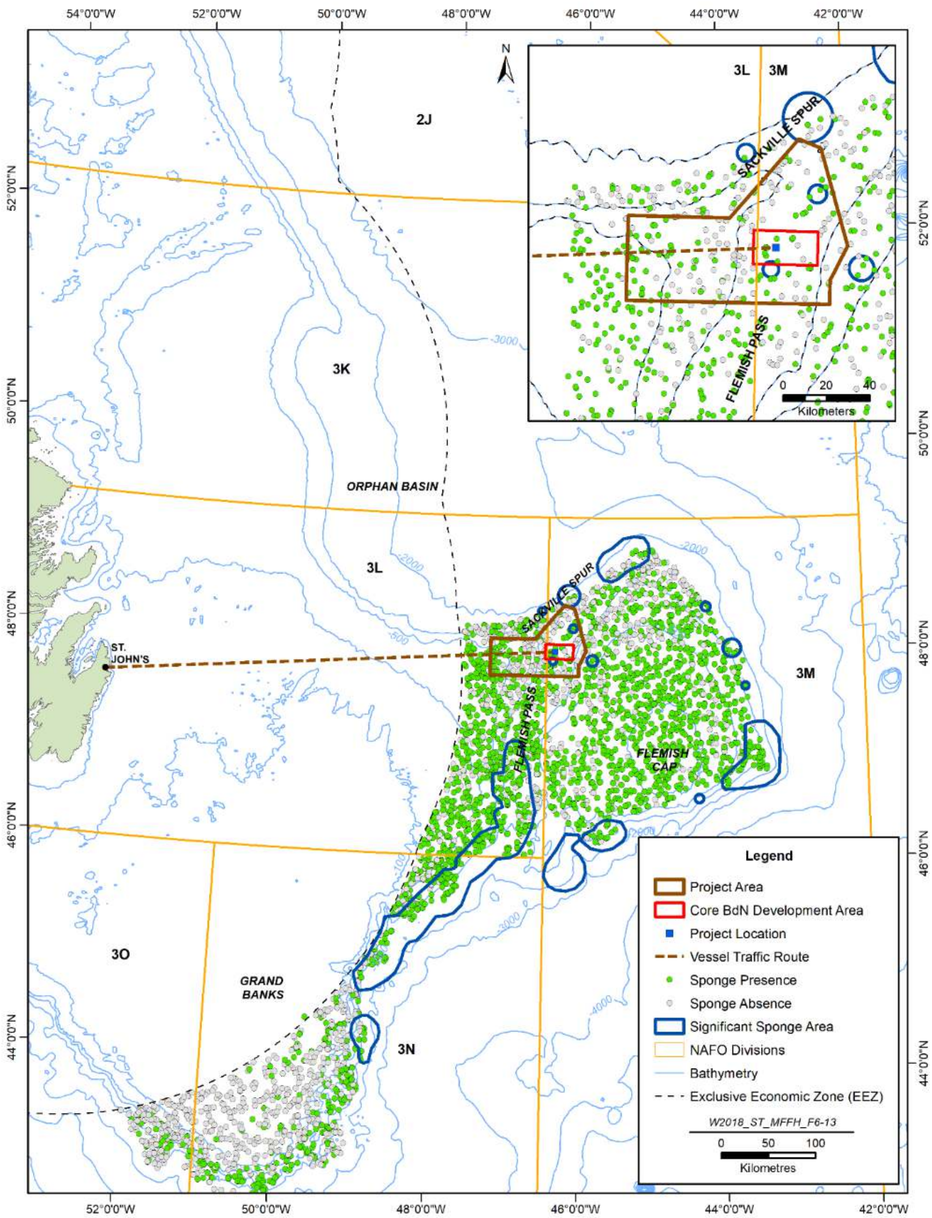


Figure 6 13 Summary of Regional Sponge Distributions Compiled from EU RV Data (2002 to 2013) with significant sponge catch data from WGESA (2017)

IR-70	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.6
DFO-56		
Context/Rationale	Figure 6-8 in Section 6.1.7.6 in the EIS does not clearly allow for the determination of densities and exact locations of corals. This information is required to understand the marine fauna that may be affected by the Project.	

Request 15-Apr-19	Provide coral data on individual maps based on functional groups or species level data, where possible.
Equinor Response 15-Nov-19	See response to IR-67/DFO-52.

IR-71	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.6
DFO-57		
Context/Rationale	Section 6.1.7.6 in the EIS states "Sedimentation has also been shown to have effects on sponge distribution through impacts on feeding and larval settling, however some soft bottom sponge species are highly resistant (Bell et al. 2015)." Bell at al. (2015) had few examples of deep-water species, with most examples from shallow and tropical waters and also states "sedimentation is thought to have a generally negative impact on sponges", "Despite our review demonstrating there are generally negative effects of suspended and settled sediment on sponges, many species have adaptive mechanisms. However, these mechanisms are still poorly understood in nearly all cases, as are the energetic consequences and ecological trade-offs of these mechanisms, and both should be a focus of future study" and "Critical gaps exist in our understanding of the physiological responses of sponges to sediment, adaptive mechanisms, tolerance limits, and particularly the effect of sediment on early life history stages".	
Request 15-Apr-19	Revise the text in Section 6.1.7.6 of the EIS by appropriately using the information by Bell et al. (2015) in Section 6.1.7.6.	
Equinor Response 15-Nov-19	Chapter 6 is a description of the existing biological environment within the Project and study areas. Further information and assessment of the effects of suspended sediments and sedimentation on sponges is provided in Section 9.2.3.2 of the EIS, including reference to Bell et al. (2015). The paragraph in Section 6.1.7.6 provides background information on factors that may influence sponge distribution including sedimentation. For clarification, the text in EIS in Section 6.1.7.6 - Sponges will be amended to read as: "For example, the large sponge grounds on the Sackville Spur FCA and VME (see Section 6.4.4.2), coincides with maximum bottom currents (Beazley and Kenchington 2015; Murillo et al. 2016b) that may transport food to the sessile, suspension-feeding sponges. ~~Sedimentation~~ ***Exposure to natural suspended and settled sediments*** has also been shown to have effects on sponge distribution through impacts on feeding, ***respiration***, and larval settling ~~however some soft bottom sponge species are highly resistant~~ (Bell et al. 2015). ***While adaptive mechanisms and associated costs are not well understood for all species, current evidence on tropical and deepwater species indicates that most sponges have some ability for tolerance of suspended and settled sediments (Bell et al. 2015). Some sponge species also have specific adaptations for thriving in these environments where fluctuating suspended or settled sediment levels are experienced (Bell et al. 2015)***."	

IR-72	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.6
DFO-59		
Context/Rationale	Section 6.1.7.6 of the EIS should include an overview map showing licences, Project Area, Sensitive Benthic Areas, fishing closures and Vulnerable Marine Species work	

	conducted by NAFO. This information is important to clearly understand the existing environment in the assessment of effects.
Request 15-Apr-19	Incorporate overview map showing licences, Project Area, Sensitive Benthic Areas, fishing closures and Vulnerable Marine Species work conducted by NAFO.
Equinor Response 15-Nov-19	The following figure will replace Figure 15-2 in the EIS.

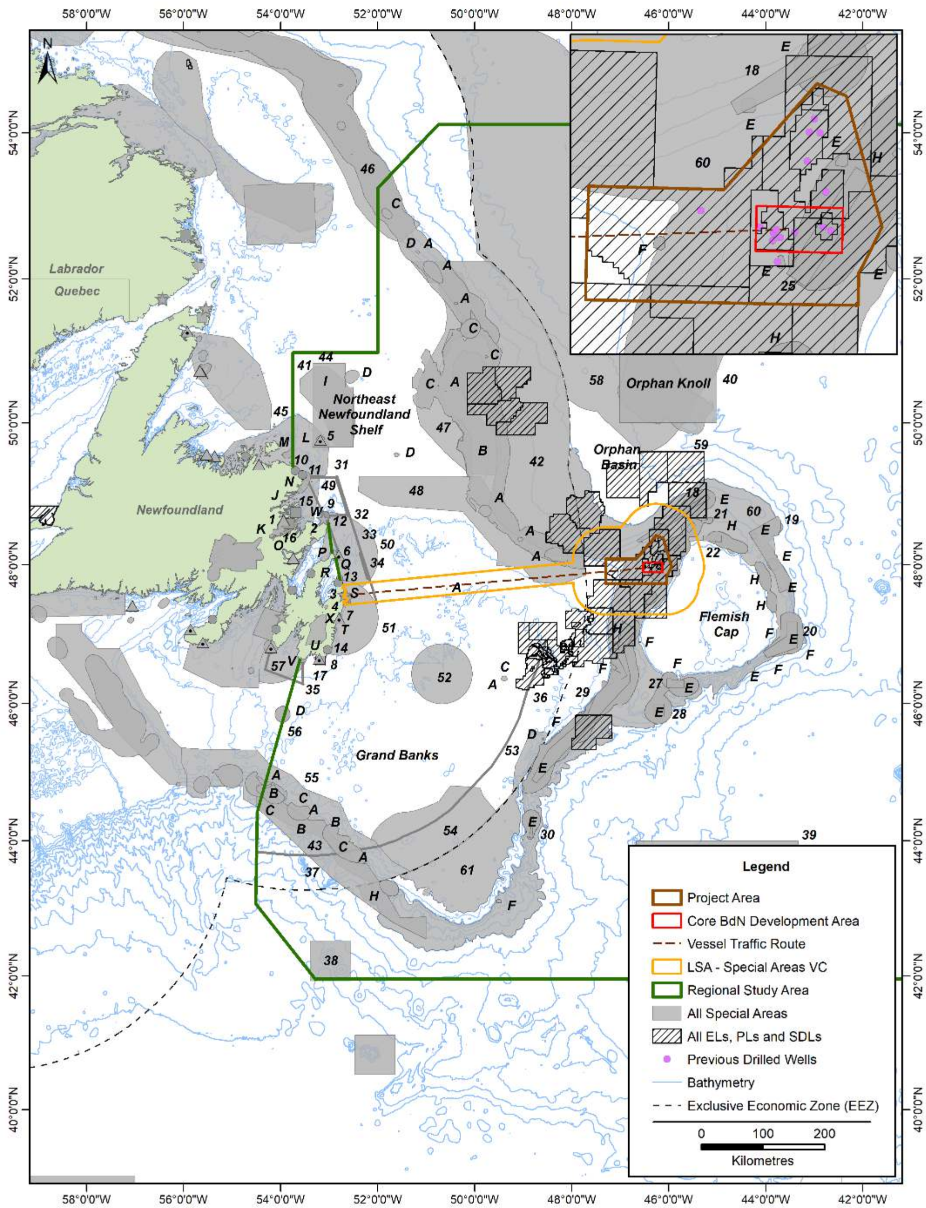


Figure 15-2 Special Areas and Oil and Gas Activities Offshore Newfoundland

Legend for Figure 15-2

Map Reference	***Special Area***
1	***Terra Nova Migratory Bird Sanctuary***

2	Ryan Premises National Historic Site
3	Signal Hill National Historic Site
4	Cape Spear National Historic Site
5	Funk Island Seabird Ecological Reserve
6	Baccalieu Island Seabird Ecological Reserve
7	Witless Bay Seabird Ecological Reserve
8	Mistaken Point Fossil Ecological Reserve
9	Cape Bonavista Lighthouse Historic Site
10	Deadman's Bay Provincial Park
14	Chance Cove Provincial Park
15	Eastport – Duck Islands Marine Protected Area
16	Eastport – Round Island Marine Protected Area
17	Mistaken Point Ecological Reserve World Heritage Site
18	Sackville Spur (6) NAFO Fisheries Closure Area
19	Northeast Flemish Cap (5) NAFO Fisheries Closure Area
20	Eastern Flemish Cap (4) NAFO Fisheries Closure Area
21	Northern Flemish Cap (8) NAFO Fisheries Closure Area
22	Northern Flemish Cap (7) NAFO Fisheries Closure Area
23	Northern Flemish Cap (9) NAFO Fisheries Closure Area
24	Northwest Flemish Cap (12) NAFO Fisheries Closure Area
25	Northwest Flemish Cap (10) NAFO Fisheries Closure Area
26	Northwest Flemish Cap (11) NAFO Fisheries Closure Area
27	Beothuk Knoll (13) NAFO Fisheries Closure Area
28	Beothuk Knoll (3) NAFO Fisheries Closure Area
29	Flemish Pass/Eastern Canyon (2) NAFO Fisheries Closure Area
30	Tail of the Bank (1) NAFO Fisheries Closure Area
31	Crab Fishing Area 5A (2 zones) Snow Crab Stewardship Exclusion Zone
32	Crab Fishing Area 6A (2 zones) Snow Crab Stewardship Exclusion Zone
33	Crab Fishing Area 6B Snow Crab Stewardship Exclusion Zone
34	Near Shore (2 zones) Snow Crab Stewardship Exclusion Zone
35	Crab Fishing Area 9A (2 zones) Snow Crab Stewardship Exclusion Zone
36	Crab Fishing Area – 8BX Snow Crab Stewardship Exclusion Zone
37	30 Coral Area Closure NAFO Fisheries Closure Area
38	Fogo Seamounts (1) NAFO Fisheries Closure Area
39	Newfoundland Seamounts NAFO Fisheries Closure Area
40	Orphan Knoll Seamount NAFO Fisheries Closure Area
41	Funk Island Deep Closure Marine Refuge

42	***Northeast Newfoundland Slope Closure Marine Refuge***
43	***30 Coral Closure (portion inside EEZ) Marine Refuge***
44	***Notre Dame Channel Ecologically and Biologically Significant Area***
45	***Fogo Shelf Ecologically and Biologically Significant Area***
46	***Labrador Slope E Ecologically and Biologically Significant Area BSA***
47	***Orphan Spur Ecologically and Biologically Significant Area***
48	***Northeast Slope Ecologically and Biologically Significant Area***
49	***Bonavista Bay Ecologically and Biologically Significant Area***
50	***Baccalieu Island Ecologically and Biologically Significant Area***
51	***Eastern Avalon Ecologically and Biologically Significant Area***
52	***Virgin Rocks Ecologically and Biologically Significant Area***
53	***Lilly Canyon-Carson Canyon Ecologically and Biologically Significant Area***
54	***Southeast Shoal Ecologically and Biologically Significant Area***
55	***Southwest Slope Ecologically and Biologically Significant Area SA***
56	***Haddock Channel Sponges Ecologically and Biologically Significant Area***
57	***St. Mary's Bay Ecologically and Biologically Significant Area***
58	***Seabird Foraging Zone in the Southern Labrador Sea CBD Ecologically and Biologically Significant Area***
59	***Orphan Knoll CBD Ecologically and Biologically Significant Area***
60	***Slopes of the Flemish Cap and Grand Bank CBD Ecologically and Biologically Significant Area***
61	***Southeast Shoal and Adjacent Areas on the Tail of the Grand Bank CBD Ecologically and Biologically Significant Area***
A	***Large Gorgonian Corals Significant Benthic Area***
B	***Sea Pens Significant Benthic Area***
C	***Small Gorgonian Corals Significant Benthic Area***
D	***Sponges Significant Benthic Area***
E	***Sponge Vulnerable Marine Ecosystem***
F	***Large Gorgonian Coral Vulnerable Marine Ecosystem***
H	***Sea Pen Vulnerable Marine Ecosystem***
I	***Funk Island Deep Box Fisheries Closures Area***
J	***Eastport Lobster Management Area Fisheries Closures Area***
K	***Terra Nova National Park***
L	***Funk Island Important Bird Area***
M	***Wadham Islands and adjacent Marine Area Important Bird Area***
N	***Cape Freels Coastline and Cabot Island Important Bird Area***
O	***Terra Nova National Park Important Bird Area***

P	***Grates Point Important Bird Area***
Q	***Baccalieu Island Important Bird Area***
R	***Cape St. Francis Important Bird Area***
S	***Quidi Vidi Lake Important Bird Area***
T	***Witless Bay Islands Important Bird Area***
U	***Mistaken Point Important Bird Area***
V	***The Cape Pine and St. Shotts Barren Important Bird Area***
W	***Dungeon Provincial Park***

IR-73 **IR-DFO-60**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.6
Context/Rationale	In Section 6.1.7.6 of the EIS the maps are outdated (2002-2013) for EU RV Data.	
Request **15-Apr-19**	Incorporate more recent data into maps for the EU RV data within Section 6.1.7.6 of the EIS.	
Equinor Response **2-May-19**	During preparation of the Bay du Nord EIS, Wood, the primary contractor used data that were currently available at the time. Since these data have not been required for previous environmental assessments in the Flemish Pass area (e.g., Nexen, Equinor, ExxonMobil), it is uncertain if we could have access to this data. The figures and data provided in the EIS provide a general indication of presence and absence of sponges, sea pens and gorgonian corals outside the EEZ. Additional data for this area would not necessarily add to the description of the environment nor the effects assessment.	
DFO Response **10-Jun-19**	DFO's Response: Equinor's response does not sufficiently address the IR. Equinor should endeavor to obtain more recent data for incorporation into maps.	
Equinor Response **15-Nov-19**	The latest data publicly available were used for the maps of corals and sponges. The maps are sufficient for determining presence of corals and sponges within the Project Area and surrounding region. The level of information provided for describing the existing biological environment is consistent with the level of information that has been accepted by the CEA Agency in the environmental assessment of other offshore oil and gas projects. Updates to the EIS are not required.	

IR-74 **DFO-61**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.7.6
Context/Rationale	It does not appear that the estimates reported in Tables 6.20 and 6.21 in Section 6.1.7.7 of the EIS considered the random-stratified design of the RV survey. This information is important to understand data quality and quantity used in the description of the environment.	
Request **15-Apr-19**	Describe potential limitations of data generated from a random-stratified design and update Tables, as necessary.	
Equinor Response **15-Nov-19**	The data presented in Table 6.20 and 6.21 of the EIS summarize available presence and abundance of species over depth zones based on the Canadian Research Vessel (RV)	

	trawls. Since 1970, Fisheries and Oceans Canada have adopted a random-stratified survey design for their annual multi-species RV trawl surveys (Chadwick et al. 2007). Random sampling is proportionally conducted within each subdivision or strata. The strata are generally fixed in space and delineated primarily by bottom depth (Kulka 1998; Chadwick et al. 2007). Biases associated with subsampling from these trawls without consideration of the strata may over or under represent abundance of particular species. Although the summaries do not specifically account for strata, they provide a general characterization of communities collected within each depth zones sufficient for environmental assessment purposes. This method is consistent with the methodology used in the Eastern Offshore SEA (AMEC 2014) and deemed acceptable by the CEA Agency in the environmental assessments of other NL offshore projects (Amec Foster Wheeler 2018; Stantec Consulting 2018; Statoil 2017; ExxonMobil Canada Properties 2017). The EIS is complete. Updates to the EIS are not required. References: Amec. 2014. Eastern Newfoundland and Labrador Offshore Area Strategic Environmental Assessment. Final Report. Submitted to Canada-Newfoundland and Labrador Offshore Petroleum Board, St. John's, NL. Amec Foster Wheeler Environment & Infrastructure. 2018. Nexen Energy ULC Flemish Pass Exploration Drilling Project (2018-2028) Environmental Impact Statement. Prepared for Nexen Energy ULC. Chadwick, E.M.P., Brodie, W., Colbourne, E., Clark, D., Gascon, D., and Hurlbut, T. 2007. History of annual multi-species trawl surveys on the Atlantic coast of Canada. Atlantic Zonal Monitoring Program Bulletin, 6: 25–42. ExxonMobil Canada Properties Ltd. 2017. Eastern Newfoundland Offshore Exploration Drilling Project – Environmental Impact Statement. Prepared by Amec Foster Wheeler and Stantec Consulting. St. John's, NL Canada. November 2017. Kulka, D.W. 1998. Spatial analysis of northern Atlantic cod distribution with respect to bottom temperature and estimation of biomass using potential mapping in SPANs. Canadian Stock Assessment Secretariat Research Document 98/13 Stantec Consulting. 2018. Newfoundland Orphan Basin Exploration Drilling Program Environmental Impact Statement. Prepared for BP Canada Energy Group ULC. Statoil. 2017. Flemish Pass Exploration Drilling Program – Environmental Impact Statement. Prepared by Amec Foster Wheeler and Stantec Consulting. St. John's, NL Canada. November 2017.

IR-75 **DFO-47**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.5.2; Section 6.1.8.1; Table 6.23, Section 6.1.8.5; Figure 6-25; Figure 6-271
Context/Rationale	There was confusion in Sections 6.1.5 and 6.1.8 of the EIS with respect to comparing fish abundance and biomass. Similarly, the results of different fishing methodologies were improperly compared in the EIS. "Some species showed increased abundance or biomass…." (Page 6-67) Note that abundance refers to numbers while biomass refers to weight. It is not clear from the	

	text if abundance or biomass (or both) increase with sponge density, although Table 6.23 mentions fish abundance only. In the caption (Contribution to survey) for Table 6.26, abundance and biomass are compared. Comparisons of abundance data and biomass data for different species can be problematic e.g., one large cod could be equal in weight to 500 lanternfishes, skewing the numbers (Page 6-78). Statement "However, copepod abundances were higher than normal on the NL Shelf…" (Page 6-17) should be revised to "However, copepod abundances, but not biomass were higher than normal on the NL Shelf". Direct comparisons of data derived from different fishing methodologies (e.g. trawl vs longline as well as different trawls with different characteristics) is usually not done. With respect to presence/ absence, comparisons should be fine, but caution should be used when comparing % abundances. As an example of the inherent bias within the methods it would appear that lanternfishes, longnose eel, and redfish were not captured via the longline method (Page 6-65). The survey gear used in EU surveys is different than that of DFO. Therefore comparisons (implied or direct) of the species composition and/or abundance cannot be made (Page 6-69). Distributional data for Canadian surveys is presented as abundance i.e. #'s per tow while the European data from the Flemish Cap is presented as biomass (kg/tow) (Page 6-84, Figures 6-25 & 6-27, and throughout). This should be fine for high level distribution purposes within the same species (Page 6-78). For the statement "Greenland halibut contributed approximately two percent of fish abundance in Canadian RV surveys and less than one percent of fish abundance in EU RV surveys (Nogueira et al. 2017; Table 6.28)." (Page 6-84), catch data were not comparable due to the significantly different characteristics of the trawls employed in each survey. This information is needed to clearly understand the environment and potential changes in the ecosystem to assess environmental effects of the Project.
Request 15-Apr-19	A. Revise noted statements. B. Ensure abundance and biomass are appropriately compared throughout the EIS, revise EIS accordingly. C. Ensure appropriate comparison of fishing methodologies throughout the EIS, revise EIS accordingly. D. Explain whether deepwater longlines were baited (Page 6-65).
Equinor Response 15-Nov-19	A. The following are in response to the specific statements identified in the IR. • *Some species showed increased abundance or biomass…." (Page 6-67) Note that abundance refers to numbers while biomass refers to weight. It is not clear from the text if abundance or biomass (or both) increase with sponge density, although Table 6.23 mentions fish abundance only.* The text on page 6-67 was an interpretation from the reference. For clarification, the text in EIS in Section 6.1.8.1 will be amended to read as: "Some species showed increased abundance or biomass with increased sponge density including deep-sea catshark, eelpouts, ***while*** spinytail skate, white skate and

deepwater chimaera ***showed increase biomass only with increased sponged density (Kenchington et al. 2013).”***

- *In the caption (Contribution to survey) for Table 6.26, abundance and biomass are compared*.

The note in Table 6.26 (Section 6.1.8.4) will be amended to read as:

> “Contribution to survey: Reported percentage of total abundance, ~~biomass,~~ or trawl presence in the survey.”

- *Comparisons of abundance data and biomass data for different species can be problematic e.g., one large cod could be equal in weight to 500 lanternfishes, skewing the numbers* (Page 6-78).

The text in Section 6.1.8.5-Atlantic Cod will be amended to read as:

> “This species comprised ***approximately*** 3~~.2~~ percent of total abundance in the EU RV survey catch ~~but was not a key species in Canadian RV surveys for the Project Area.~~ ***on the Flemish Cap. Atlantic cod was not an abundant species in available Canadian RV surveys within the Project Area.”***

- *Statement “However, copepod abundances were higher than normal on the NL Shelf…” (Page 6-17) should be revised to “However, copepod abundances, but not biomass were higher than normal on the NL Shelf”.*

The text in Section 6.1.5.2 will be amended to read as:

> “However, copepod abundances ***but not biomass*** were higher than normal on the NL Shelf in 2016, and cooler water temperatures in recent years has brought about higher abundances of *C. glacialis* and *C. hyperboreus* (DFO 2017d).”

- *Direct comparisons of data derived from different fishing methodologies (e.g. trawl vs longline as well as different trawls with different characteristics) is usually not done. With respect to presence/ absence, comparisons should be fine, but caution should be used when comparing % abundances. As an example of the inherent bias within the methods it would appear that lanternfishes, longnose eel, and redfish were not captured via the longline method (Page 6-65).*

Information from the trawl and longline surveys are presented to provide information regarding fish species presence at different depths. Updates to the EIS are not required.

- *The survey gear used in EU surveys is different than that of DFO. Therefore comparisons (implied or direct) of the species composition and/or abundance cannot be made (Page 6-69).*

As noted below, various gear types will capture different species. However, these studies are sufficient for determination of species presence in the area and at different depth zones.

For clarification, the text in Section 6.1.8.2 will be amended to read as:

> “The Flemish Cap has been characterized through Canadian and EU RV surveys that sample within and outside the Project Area. ***While there are differences between the Canadian and EU RV survey gear types, associated information is sufficient for determination of species presence and distribution across depth zones***.”

- *Distributional data for Canadian surveys is presented as abundance i.e. #’s per tow while the European data from the Flemish Cap is presented as biomass (kg/tow)*

	(Page 6-84, Figures 6-25 & 6-27, and throughout). This should be fine for high level distribution purposes within the same species (Page 6-78). The distributional data are used to identify areas of aggregation at a high level as noted. The level of information provided for describing the existing biological environment is consistent with the level of information that has been deemed acceptable by CEA Agency in the environmental assessment of other offshore oil and gas projects. Updates to the EIS are not required. • *For the statement "Greenland halibut contributed approximately two percent of fish abundance in Canadian RV surveys and less than one percent of fish abundance in EU RV surveys (Nogueira et al. 2017; Table 6.28)." (Page 6-84), catch data were not comparable due to the significantly different characteristics of the trawls employed in each survey.* For clarification, the text in Section 6.1.8.5 will be amended to read as: ***"Greenland halibut were identified as key species within the Project Area from the Canadian RV surveys (Table 6.28).*** Greenland halibut contributed approximately two percent of fish abundance in Canadian RV surveys and less than one percent of fish abundance in EU RV surveys (Nogueira et al. 2017; Table 6.28)." B/C. As stated in Section 6.1.1, the EIS draws upon a variety of data sources including government and industry reports and peer reviewed scientific literature. Data from each source are not necessarily directly comparable based on survey type (e.g., benthic grab, trawl, underwater images, longline) as each method may have biases towards particular species. For example, the type of species captured in trawl surveys is highly dependent on mesh size. This can also be an issue, as noted by reviewers, with comparisons across species. Therefore, abundance and biomass are not typically directly compared in the EIS. For example, a single Greenland shark may be lower in abundance than 100 capelin but would have a higher biomass. Instances where biomass and abundance are discussed together, they are generally interpretation from the data source. Information in the EIS is provided to characterize species within the Project Area based on data surveys and sampling within and adjacent to the Project Area. This includes presentation of characteristic species identified by each survey type. The various metrics from original reports and scientific literature are maintained in the EIS to reflect the survey method and minimize any reinterpretation or recalculation of data. The contribution to survey indicated the percentage of the reported measure within a survey (e.g., abundance or biomass or trawl presence) rather than across different survey methods or metrics. For clarification, the text in EIS in Section 6.1.1 will be amended to read as: "This section builds upon the fish and fish habitat information presented in the SEA by summarizing critical elements, augmenting the information with more detailed or more recent information available in the literature (Table 6.1) and providing additional analyses specific to the Project Area and LSA where available. It provides a holistic overview of fish and fish habitat, key species, and their trophic interactions. Summarized data are based on representative studies or data that are applicable to the Project Area. ***Each study or data source is based on a particular survey method (e.g., benthic grab, trawl, underwater images or video, longline) with inherent biases towards capturing particular species. Therefore, data metrics (e.g., total abundance, biomass, abundance per tow) are maintained in representation of data in figures and tables to reflect the survey type and original analyses. Although these studies are not directly***

	comparable, they provide sufficient information for characterizing the presence species within the Project Area. Project Area specific data and analysis are provided where such information is available." D. Murua and de Cardenas (2005) longline survey used hooks baited with squid. For clarification, the text in Section 6.1.8.1 of the EIS will be amended to read as: "The deep-water ***baited*** longline survey described in Murua and de Cardenas (2005) provides relevant and representative information for the Flemish Cap, Flemish Pass and Grand Bank slopes (Table 6.22)." References: Murua, H. and E. de Cárdenas. 2005. Depth-distribution of deepwater species in Flemish Pass. Journal of Northwest Atlantic Fisheries Science, 37: 1-12.

IR-76 **DFO-62**	**Guideline Ref:** Part 2, Section 7.1.3, Section 7.3.1	**EIS Ref:** Section 6.1.8.1
Context/Rationale	To demonstrate taking an ecosystem approach in the EIS consideration should be given to identifying functional fish groups as a Valued Component. A functional group is a grouping of species based on general size and known food habits. The table of dominant species in DFO's trawls shows which fish species dominate their respective functional groups (in terms of average kg/tow in DFO's multispecies trawls; a better metric for determining dominance than mean abundance) and are found in relatively high densities within the LSA and/or the core BdN development area, as well as at-risk species found in the LSA and core areas. A tech report is being drafted now with maps that illustrate these densities. As some of these species have very specific habitat preferences, it would be important to consider the environmental impacts on them in the LSA and Core Bay du Nord Area.	
Request **15-Apr-19**	Ensure all dominant species are described (e.g., Section 6.1.8.5) and incorporated in the effects assessment (e.g., sculpin species, Witch Flounder). A table of dominant species within functional groups is provided below.	
Equinor Response **15-Nov-19**	The key fish species information in the EIS (Sections 6.1.8) is based on available data sources (e.g., Canadian Research Vessel surveys, European Union RV surveys). Key species are those that comprise 95 percent of total abundance in Canadian RV surveys in the Project Area and EU RV surveys for the Flemish Cap (Section 6.1.8.5). For clarity the following text will be added to Section 6.1.3 of the EIS: "In most cases, key species were based on either numerical dominance (based on the existing and available datasets) or their conservation status. ***Key fish species discussed in the EIS are those that comprise 95 percent of total abundance in Canadian RV surveys in the Project Area and EU RV surveys for the Flemish Cap (see Section 6.1.8.5)***." Black dogfish, common wolf eel, and lantern shark observed during seabed surveys were not considered key species in the Project Area, or in Fisheries and Oceans Canada's review of the EIS (IR-77 (DFO-63), Appendix A). Additional information regarding these species does not change the overall environmental description nor the effects Sculpin species and witch flounder are not species at risk and are not identified as key species in the EIS based on abundance in the Project Area (see Section 6.1.8.5). Therefore, these species were not further described in the EIS. Species from each of the	

	functional groups (e.g., small benthivores, medium benthivores, large benthivores, piscivores, plank-piscivores, and planktivores) are described in the EIS. Information was also provided on species of conservation concern (Section 6.1.9) based on designations and potential overlap with the Project Area. During the EIS Regulatory Review Workshop in May 2019, in reference to this IR, DFO indicated that if species observed during Equinor surveys are a dominant species or at risk, then those species should be described in the EIS. These species (wolf eel – *Lycenchelys* sp., black dogfish – *Centroscyllium fabricii* and a type of lantern shark) have not been identified as dominant or species at risk or conservation concern under provincial or federal frameworks. The black dogfish has only been listed as "Least Concern" under the International Union for Conservation of Nature (IUCN). Additional information on these species will not change the overall assessment on Species at Risk as described in Section 9.4 of the EIS. The information which has been provided is sufficient and updates to the EIS are not required. Information regarding the ecosystem approach can be found in response to IR-32/Conformity DFO-1

IR-77 **DFO-63**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.1
Context/Rationale	Section 6.1.8.1 of the EIS should have information detailing that the results are conditional on the selectivity of the trawl (DFO survey uses a shrimp trawl w/ small-mesh liner) that influences the rates of capture by size for each spp, and different gear types would yield different compositions. It cannot be taken to mean that these percentages represent the percentage of all benthic resources. Further, DFO surveys cover only a portion of the Flemish Pass. The lack of survey information for depths >732 m is also pertinent. This is inconsistent with the EIS statement of no data beyond 1000 m. It is important to understand sampling bias in describing the existing environment. This information is needed to understand the species that occupy the different habitats in order to assess environmental effects of the Project.	
Request **15-Apr-19**	A. Update Section 6.1.8.1 of the EIS to include description of conditions associated with DFO surveys. B. Specify depth limit for data collection.	
Equinor Response **15-Nov-19**	A. As noted in Section 6.1.8.1 available Canadian Research Vessel (RV) trawl data within the Project Area is "between 340 and 1,000 m in the Project Area (no data beyond 1,000 m water depth)". Equinor Canada disagrees with the reviewer's statement that there is a lack of survey information for depths >732 m. There is no statement in Section 6.1.8.1, page 6-65 of the EIS that there is a lack of survey information for depths >732 m with regards to the Canadian RV data. Various datasets, including the Canadian RV Data, NAFO research documents and scientific publications, are all considered for characterizing the existing biological environment and to offset limitations of any single data source. The EIS is complete, no additional information is required.	

	B. Details on the Canadian Research Vessel (RV) data are presented in Section 6.1.1.1. For clarification regarding the limitations of the survey data, the text in Section 6.1.1.1 of the EIS will be amended to read as: "Data for the monitoring and management of fish resources in Newfoundland and Labrador (NL) are derived from standardized scientifically-directed spring (NAFO Divisions 3LNOPs) and fall (NAFO Divisions 2J3KLNO) RV trawl surveys. ~~within the two~~ ***Survey trawls from*** fisheries management areas ~~that~~ ***NAFO Division 3L*** overlap***s*** with the Project Area (NAFO Divisions 3LM, see Section 7.1.9). Canadian RV surveys extend to depths of approximately 1,450 m on the continental slope and provide insight into the distribution and abundance of commercially and/or ecologically important species. ***While the multi-species trawl data are an important source of information on fish and invertebrate species within the study areas, there are limitations of this data source including species selectivity associated with survey equipment (i.e., Campelen 1800 trawl with small mesh liner) and method (e.g., tow speed) (Walsh et al. 2019), and trawl depths (i.e., available trawls in Project Area from 340-1000 m).*** Although the multispecies surveys have been conducted for several decades, six years of recent available data (2011 to 2016) were synthesized in this summary as the Northwest Atlantic's ecosystem has experienced ecological shifts and remains in a state of flux (Dawe et al. 2012; Nogueira et al. 2016, 2017)***."*** References: ***Walsh, S. J., Hickey, W. H., Porter, J., Delouche, H., & McCallum, B. R. (2009). NAFC Survey Trawl Operations Manual: Version 1.0. Fisheries and Oceans Canada, Northwest Atlantic Fisheries Centre, Newfoundland Region, St. John's, Canada.***

IR-78 **DFO-64**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.1, Tables 6.21 and 6.22
Context/Rationale	Information related to sampling effort should be provided (i.e., # individual sets/longline hauls for each slope depth range) in Section 6.1.8.1 of the EIS. This information is needed to understand sampling biases that may influence the description of marine biota. It is not clear whether "Contribution (%)" from Table 6.21 is the same as "Percent Abundance (%)" from Table 6.22. If so, the terminology between the tables should match.	
Request **15-Apr-19**	A. Describe sampling effort in Section 6.1.8.1 of the EIS. B. Ensure appropriate use of 'percent abundance' and 'contribution percentage' so data presented in tables can be appropriately compared.	
Equinor Response **15-Nov-19**	A. Information is presented in Section 6.1.8.1 of the EIS regarding the Murua and de Cardenas (2005) deep-water longline survey. Murua and de Cardenas (2005) identify the distribution of hauls by strata and NAFO Divisions; however, the data are not broken down by depth categories of catches. Existing notes at the end of the table provide available information from source material on depths and hauls (64 longline hauls collected from 708 m to 3,028 m). B. For Table 6.22, percent abundance (%) would be the same as contribution (%). The header and footer text Table 6.22 of the EIS will be amended to read as: Header text: Depth Zone | Common Name | Scientific Name[1] | ***"Contribution (%)[2]"***	

	Footer text Source: Murua and de Cardenas (2005). ***"Data are based on 64 longline hauls collected from 708 m to 3,028 m."*** [1]Taxonomic Group: F – Family [2] "***Contribution to survey: Reported percentage of survey study metric (e.g., total abundance in the survey).***"

IR-79 **DFO-65**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.1, Table 6.22
Context/Rationale	The caption in Table 6.22 in Section 6.1.8.1 of the EIS states "Percent Abundance is based on 64 longline hauls collected from 708 m to 3,028 m" It is unclear if the data presented has been based upon data collected to 1,500 m (as stated in the table) or if the data is based upon data down to 3,028 m. It is also unclear if the data was weighted to account for the missing hauls between 1,500 m and 3,028 m. Details on locations or longline hauls were not provided. Although the Table notes sampling along the slopes of Flemish Cap, Flemish Pass, and Grand Banks, it is not possible to differentiate between these areas. This information is needed to describe the marine communities that occupy different habitats in order to assess environmental effects of the Project.	
Request **15-Apr-19**	A. In Table 6.22 in Section 6.1.8.1 describe 'percent abundance', including details on weighting. B. Describe if any information in Murua and Cardenas (2005) was included in the EIS that delineates locations of longline hauls. C. Describe noticeable differences between fish distributions in the different areas along the slopes of Flemish Cap, Flemish Pass, and Grand Banks.	
Equinor Response **15-Nov-19**	A. Information on percent abundance is described in response to IR-78/DFO-64. B. In Murua and de Cardenas (2005) Longline survey hauls at <1,500 m were sampled in NAFO Divisions 3LMN on the slopes of the Flemish Cap, Flemish Pass, and Grand Banks. Data presented in Murua and de Cardenas (2005) provide overall species composition for each NAFO Division but does not distinguish among depth zones within each NAFO Division. Longline survey hauls >1,500 m were sampled in NAFO Divisions 3MN on the slopes of the Flemish Cap and southern Grand Banks. As these depths are not present in the Project Area, these data were not presented. The EIS is complete. Updates to the EIS are not required. C. Baited longline sampling stations in 3M on the Flemish Cap and northern Grand Banks were distributed from 700 to 3,100 m depth. Top species by percent abundance in this division included roughhead grenadier, blue hake, and small eyed rabbitfish. Baited longline sampling stations in 3L on the Flemish Pass and eastern Grand Banks were distributed from 700 to 1599 m depth. Top species by percent abundance in this division included roughhead grenadier, blue hake, and black dogfish. Baited longline sampling stations in 3N on the southern and eastern Grand Banks were distributed from 700 to 3,100 m depth. Top species by percent abundance included blue hake, roughhead grenadier, and skates. Data presented in Murua and de Cardenas (2005) do not distinguish among depth zones within each	

	NAFO division. Information summarized in the EIS was focused on catch composition in depth zones relevant to the Project Area based on the overall dataset. The EIS is complete. Updates to the EIS are not required. References: Murua, H. and E. de Cárdenas. 2005. Depth-distribution of deepwater species in Flemish Pass. Journal of Northwest Atlantic Fisheries Science, 37: 1-12.

IR-80	**Guideline Ref:** Part 2, Section 7.1.9.2	**EIS Ref:** Section 6.1.8.2
DFO-139		
Context/Rationale	Section 6.1.8.2 of the EIS erroneously notes a directed fishery for American plaice. There is no directed fishery for American Plaice it is currently bycatch only (see paragraph 1, last sentence).	
Request **15-Apr-19**	Revise sentence on a bycatch of American plaice in Section 6.1.8.2 of the EIS.	
Equinor Response **15-Nov-19**	The text in Section 6.1.8.2 of the EIS will be amended to as: "The Flemish Cap is subject to international ***groundfish harvesting as either a targeted fishery or as by-catch*** for species including Atlantic cod, redfish, halibut, American plaice, and roughhead grenadier (Alpoim and González Troncoso 2016; Nogueira et al. 2017) (see Section 7.1.5)."	

IR-81	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.3
DFO-67		
Context/Rationale	The statement in Section 6.1.8.3 of the EIS that pelagic species are "in many cases" represented in bottom trawl data is highly questionable. Equipment, technique and sample depths for surveying pelagic species are different than for surveying for benthic species. Pelagic species may be incidentally collected in a bottom trawl as the gear is dropped to and raised from the seafloor passing through pelagic habitat. Accurate information on sampling equipment is needed to understand the marine fauna in order to assess environmental effects of the Project.	
Request **15-Apr-19**	Revise statement in Section 6.1.8.3 of the EIS on consideration of species targeted by bottom trawling.	
Equinor Response **15-Nov-19**	The text in Section 6.1.8.3 of the EIS will be amended to read as: "Pelagic species within the Project Area include resident pelagic species (such as capelin and lanternfish) and migratory warm-water pelagics (tunas, swordfish and several shark species). Resident species are able to carry out their life histories within the cold, northern waters and, in ***certain*** cases, are well-represented in the RV survey data." The amendment to the text does not affect the EIS conclusions respecting the potential effects of the Project on the named pelagic species.	

IR-82 **DFO-68**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.3
Context/Rationale	The caption in Table 6.26 in Section 6.1.8.3 of the EIS contains the text: "Contribution to survey: Reported percentage of total abundance, biomass, or trawl presence in the survey." It is unclear what this measurement unit is referring to as only "Sections Present (%)" is listed as a column label. It is also unclear what the "Contribution to Fishes (%)" column is referring to or how it is calculated. Accurate use of information is needed to understand the marine fauna in order to assess environmental effects of the Project.	
Request **15-Apr-19**	A. In Table 6.26 in Section 6.1.8.3 of the EIS describe the measurement unit "Sections Present (%)" column. B. Clarify that the "Sections" are standardized with respect to time and distance and describe the standards. C. Describe the "Contribution to Fishes (%)" column.	
Equinor Response **15-Nov-19**	A/B. The term "sections present" is the percentage of sections where a species was present. ROV sections are individual minutes of reviewed video, not standardized distances. AUV sections are roughly 60 m long, representing 100 photos taken. Survey methodology is presented in Section 6.1.1.5 of the EIS and appended to this Response Document (IR-64/DFO-48;DFO-58) C. Contribution to fishes (%) is percent contribution of that species' abundance to the total abundance of fish. For clarity, the footer in Table 6.26 will be amended to read as: "Contribution to ~~survey~~: ~~Reported percentage of total abundance, biomass, or trawl presence in the survey.~~ **fishes (%) is percent contribution of that species' abundance to the total abundance of fish."**	

IR-83 **DFO-69**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.4, Table 6.27
Context/Rationale	Information on the transects is not provided in Section 6.1.8.4 of the EIS. Are the individual transects of equal time and length? If not, the times and/or distances should be included in the Table 6.27 of the EIS and the calculations should be weighted to reflect this. Accurate use of information is needed to understand the marine fauna in order to assess environmental effects of the Project. The presence of a number of unidentified fish raises concern, particularly in the context of such small overall numbers (Table 6.26 also). There should be no fish species that cannot be identified from this area. There is expertise within DFO that can be availed of to identify fish species from either video still photographs or video footage. This information is needed to describe the marine fauna to assess environmental effects of the Project	
Request **15-Apr-19**	Describe transects and consider weighting the calculations, as necessary.	
Equinor Response **15-Nov-19**	The preliminary data from the 2018 Equinor Canada Seabed Survey described in Section 6.1.7.5 of the EIS were provided to support existing literature and reports to describing the baseline environment. As indicated in response to IR-126/CEAA-56, the EIS will be updated to provide additional coral and sponge data. Survey methodology and analysis is	

	presented in Section 6.1.1.5 of the EIS and additional information is provided in response to IR-64/DFO48,58. As described in the EIS, the 2018 survey included remotely operated vehicle (ROV) and autonomous underwater vehicle (AUV) to collect video and image data, respectively. ROV sections were analyzed by time intervals of minutes of reviewed video, not standardized distances. AUV sections are approximately 150m long, representing 100 photos taken. The AUV takes continuous images along the survey transect. Images were selected to avoid overlap among AUV imagery. The information confirms presence of species or taxonomic groups within the Project Area.

IR-84 **DFO-4**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.3
Context/Rationale	Regarding the Inner Bay of Fundy population of Atlantic Salmon, Section 6.1.8.3 of the EIS states “interaction with the Project Area is unlikely” (Page 9-94), is inconsistent with “interaction with the Project Area does not occur” (Page 6-71). Clarity in describing potential interactions is important to assessing environmental effects of the Project	
Request **15-Apr-19**	In Section 6.1.8.3 of the EIS, ensure consistent description of potential occurrence of Atlantic Salmon (Inner Bay of Fundy population) in the Project Area, and update EIS accordingly.	
Equinor Response **15-Nov-19**	References to the Inner Bay of Fundy population of Atlantic salmon was reviewed to ensure consistency throughout the EIS. The text in Section 6.1.8.3 of the EIS, will be amended to read as: “Overwintering habitat for the iBoF is suggested to be off the Scotian shelf or the southern portion of the Gulf of Maine, therefore interaction with the Project Area ***is unlikely to occur***.”	

IR-85 **DFO-70**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.5
Context/Rationale	The “stock(s)” of Atlantic cod in Section 6.1.8.5 of the EIS statement “The stock remains a small percentage (less than three percent) of historical levels ….” is unclear. For the last three sentences in the first paragraph, the notes on stock status are significantly out of date. There have been several reports in the past decade which report different findings than are reported here (e.g., <3% historical). Note that Flemish Cap Cod has fully recovered and stock levels are now at an all-time high. Accurate use of information is needed to understand the marine fauna in order to assess environmental effects of the Project.	
Request **15-Apr-19**	A. Identify which stock is referred to in Section 6.1.8.5 of the EIS (i.e. Northern cod 2J3KL), and update EIS accordingly. B. Ensure most accurate, up-to-date information is presented and used to assess the effects of the Project.	
Equinor Response **15-Nov-19**	The text in Section 6.1.8.5 of the EIS will be amended to read as (includes revisions as noted in IR-75/DFO-47: “Atlantic cod inhabit coastal and offshore regions from shallow waters to depths of approximately 460 m (Scott and Scott 1988) and are listed as Endangered under	

	COSEWIC. This species comprised approximately 3 percent of total abundance in the EU RV survey catch on the Flemish Cap. Atlantic cod was not an abundant species in available Canadian RV surveys within the Project Area. Atlantic cod is an iconic species that dominated the groundfish fishery for centuries and has long been associated commercially and culturally with NL (COSEWIC 2010b). However, poor environmental conditions and excessive fishing caused the collapse of the stock and resulted in significant and broad socioeconomic and ecological consequences (Worm and Myers 2003; Dawe et al. 2012***; DFO 2018***). ***Cod are showing some signs of recovery after two decades of restricted fishing with variations among areas (Koen-Alonso et al. 2010; Nogueira et al. 2014). In recent stock assessments for NAFO Division 2J3KL Atlantic cod, the offshore biomass has largely increased over the past decade with the exception of southern areas of Division 3L (DFO 2018). However, the spawning stock biomass still remains below the average spawning stock biomass during the 1980's (conservation limit reference point) (DFO 2018). Atlantic cod catches by Spanish surveys in Division 3L are variable with increased catches from 2009-2011 and declines in 2013-2014 and again in 2017 (Román et al. 2018). Future recovery of the stock may also be affected by low levels and poor recruitment of capelin and simultaneous low levels of shrimp (DFO 2018). Atlantic cod stocks in NAFO Division 3M on the Flemish Cap appear to be recovering with increases in spawning stock biomass since 2005 to highest levels in 2017 and 2018 (González-Troncoso et al. 2018). Observations of slower growth and maturation in Atlantic cod from this area also suggests that the stock is in the recovery process (González-Troncoso et al. 2018). Threats to this species include overfishing, by-catch mortality, and a low productivity state of the ecosystem that may impact recovery (COSEWIC 2010b; DFO 2018).***" The additional information does not change the effects assessment and the EIS conclusions remain valid. References: ***DFO. 2018. Stock assessment of Northern cod (NAFO Divisions 2J3KL) in 2018. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2018/038. (Erratum: August 2018)*** ***Gonzalez-Troncoso, D., Fernandez, C., and F. Gonzalez-Costas. 2018. Assessment of the Cod stock in NAFO Division 3M. Northwest Atlantic Fisheries Organization Scientific Council Research Document. 18/042. Serial No. N6833.*** ***Román, E., González-Troncoso, D., and M. Alvarez. 2018. Results for the Atlantic cod, roughhead grenadier, redfish, thorny skate and black dogfish of the Spanish Survey in the NAFO Div. 3L for the period 2003-2017. Northwest Atlantic Fisheries Organization Scientific Council Research Document. 18/018. Serial No. N6802.***

IR-86	**Guideline Ref:** Part 2, Section 7.1.3, Section 7.1.9.1	**EIS Ref:** Section 6.1.8.5
DFO-71		
Context/Rationale	Section 6.1.8.5 of the EIS states that "…no critical habitat has been established for Atlantic cod, however the Southeast Shoal and Tail of the Banks, Virgin Rocks, and Burgeo Banks EBSAs are considered important spawning areas for cod (Templeman 2007)". Atlantic cod were also a key feature of the Northeast Slope EBSA. This information is needed to describe the marine fauna correctly to assess environmental effects of the Project	

Request **15-Apr-19**	Include Northeast Slope EBSA in Figure 6-14 and update EIS accordingly.
Equinor Response **15-Nov-19**	Section 6.1.8.5 – Atlantic Cod of the EIS indicates that there are high cod aggregations present on the NL shelf. Equinor Canada disagrees with the reviewer's comment that Atlantic cod is a key feature of the Northeast Slope EBSA. Based on descriptions of the Northeast Slope EBSA (formerly Northeast Shelf and Slope) in Templeman (2007) and DFO (2016) there is no information to indicate that Atlantic cod are a key feature as a rationale for designation as an EBSA. The EIS is complete. Updates to the EIS are not required. References: Templeman, N.D. 2007. Placentia Bay-Grand Banks Large Ocean Management Area Ecologically and Biologically Significant Areas. DFO Canadian Science Advisory Secretariat Research Document, 2007/052. DFO. 2016. Refinement of Information Relating to Ecologically and Biologically Significant Areas (EBSAs) Identified in the Newfoundland and Labrador (NL) Bioregion. DFO Can. Sci. Advis. Sec. Sci. Resp. 2016/032.

IR-87 **DFO-5**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.5
Context/Rationale	In Section 6.1.8.5 of the EIS the 2018 Equinor Canada Seabed Survey identified fish (Tables 6.26, 6.27), such as Black Dogfish, Common Wolf Eel and Lantern Shark, that are not subsequently described in Section 6.1.8.5. Species that occur in the Core BdN Development Area should be described. This information is important to fully and consistently describe the marine fauna and understand the different habitat requirements to assess environmental effects of the Project.	
Request **15-Apr-19**	A. Update Section 6.1.8.5 of the EIS to include species that were observed in the Core BdN Development Area. B. Update effects assessment, as necessary.	
Equinor Response **15-Nov-19**	See response to IR-76/DFO-62.	

IR-88 **DFO-72**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.5
Context/Rationale	Section 6.1.8.5 of the EIS report does not address or acknowledge the importance of inshore and coastal areas for Atlantic Cod. E.g., the largest known spawning aggregation of cod was in Smith Sound throughout the late 1990s and early 2000s, not the offshore as implied. Additionally, juvenile rearing areas are located in abundance in many inshore and coastal areas through this period, and into the present day.	
Request **15-Apr-19**	Describe the contribution of the inshore and coastal areas for Atlantic cod (e.g., spawning, juvenile rearing areas).	
Equinor Response **2-May-19**	Equinor Canada responded to this IR in May 2019. The following information was provided:	

	As in standard EA methodology, the EIS provides a description of the biological environment in the areas likely to be affected by Project activities, in this case the Project Area and the LSA. Inshore and coastal areas for Atlantic Cod are not within the Project Area. Coastal areas are addressed in Chapter 16, respecting potential impacts from accidental events, and includes the coastal nursery area. Updates to the EIS are not required.
DFO Response 10-Jun-19	Response is adequate.

IR-89 **DFO-73**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.5
Context/Rationale	In Section 6.1.8.5 of the EIS, the description for Greenland Halibut is limited. There are descriptions of "highly migratory capabilities", yet there is no information presented in support of the statement.	
Request 15-Apr-19	Update the ecological description for Greenland Halibut (e.g., where are they known to go, where do they hatch, where are nursery areas?).	
Equinor Response 15-Nov-19	Section 6.1.8.5 – Greenland Halibut of the EIS notes that that Greenland Halibut from the Grand Banks make large spawning migrations northward to the Davis Strait. For clarification, the text in Section 6.1.8.5 – Greenland Halibut will be amended to read as follows: "The high migratory capabilities of this species and continuous deepwater habitat supports intermixing and a genetically homogenous population in the North Atlantic (Vis et al. 1997). Morgan (2016) indicates that Greenland halibut populations in NAFO areas 2J3K have been increasing in abundance in recent years but populations in 3LNO have been declining. Greenland habitat from the Grand Banks also make large spawning migrations ***(>1500 km)*** northward to the Davis Strait (Bowering 1984; Junquera and Zamarro 1994; ***Coad and Reist 2018***). In the Flemish Pass area, adults may remain in the area for spawning, with spawning peaks from July to August and in December (Junquera and Zamarro 1994). Spawning occurs in deep waters of 600 m to more than 1,200 m where the eggs float and hatch. As the larvae develop and increase in size, the Greenland halibut rise towards surface waters where they are carried by surface currents to nursery areas (Sohn et al. 2010). ***Nursery areas may include the Baffin Bank and the slopes around Disko Bay, Greenland, and they presumably return to Newfoundland water when grown (Coad and Reist 2018). Young remain pelagic until reaching 80 mm in length, at which point they metamorphose and settle on the bottom (Coad and Reist 2018)"*** References: ***Coad, B.W. and J. D. Reist, Eds., 2018.Marine Fishes of Arctic Canada. Toronto: University of Toronto Press, 2018. XIII + 618 p.***	

IR-90 **DFO-74**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.8.5
Context/Rationale	Regarding the statement in Section 6.1.8.5 of the EIS, "Capelin are found at their highest concentrations along the shelf of the Grand Banks (Figure 6-32) with high concentrations of over 89,000 fish per tow in places." (Page 6-105), RV bottom trawl surveys are not the	

	best practice to sample pelagic species like capelin (acoustic surveys are used for estimating pelagic species biomass). The EIS should avoid providing numbers in the document as capelin data from the RV surveys are primarily used for presence/absence rather than biomass estimates. It is recommended that information from the DFO annual Capelin Survey which encompasses a portion of the Grand Banks be included in the EIS. Similarly, bottom trawls are not an appropriate method for sampling mackerel (also pelagic) (Page 6-108), as it makes conclusions erroneous. It is not clear whether information is available on capelin and herring distributions from EU Surveys conducted on the Flemish Cap. This information is important to accurately describe the marine fauna and understand the different habitats to assess environmental effects of the Project
Request 15-Apr-19	A. Revise descriptions for capelin and mackerel to reflect the inappropriate nature of trawl surveys to capture these pelagic species, and update EIS accordingly. B. Revise description of capelin by incorporating capelin survey data from the Grand Banks, and update EIS accordingly. C. Provide information on capelin and herring distributions from EU RV Surveys conducted on the Flemish Cap, if available, and update EIS accordingly.
Equinor Response 15-Nov-19	A. The text in Section 6.1.8.5 of the EIS will be amended to read as: "In the northwest Atlantic, mackerel are found at their highest concentrations along the Scotian Shelf and the Gulf of St. Lawrence ***(OBIS 2019). Mackerel is unlikely to be distributed within the Project Area and therefore is not a key species for the purposes of environmental assessment***." B. The text in Section 6.1.8.5 of the EIS will be amended to read as: "***Although Canadian RV surveys are not well suited to sampling pelagic species such as capelin, they are appropriate for confirmation of presence or absence in an area. Within the multi-species survey area, capelin are primarily observed on the shelf of the Grand Banks (Figure 6-32).*** Capelin were not captured in Canadian RV surveys in the Project Area and were not a key species on the Flemish Cap (Frank et al. 1996)." C. The available capelin and herring data from EU surveys on the Flemish Cap do not support plotting on distributional maps. Updates to the EIS are not required. References: ***OBIS; Ocean Biogeographic Information System 2019. Scomber scombrus Linnaeus, 1758. Retrieved from https://obis.org/taxon/127023.***

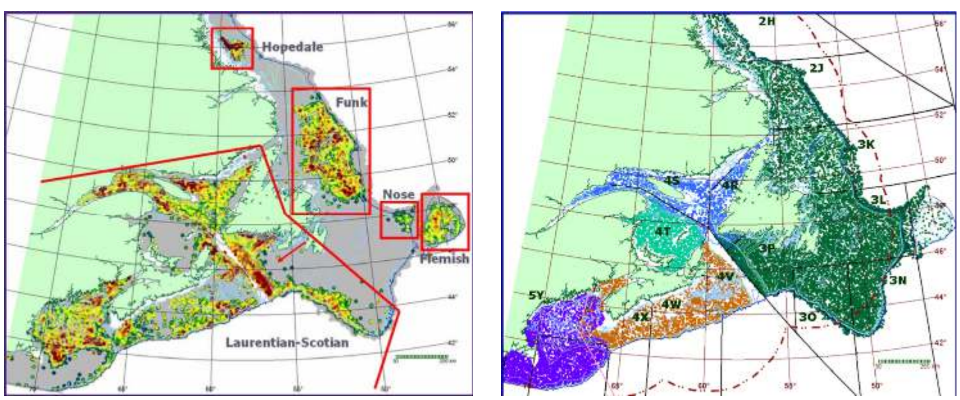
IR-91 **DFO-6a,7a**	**Guideline Ref:** Part 2, Section 7.1.5	**EIS Ref:** Section 6.1.8.5
Context/Rationale	The EIS Guidelines require a description of species listed under the SARA and assessed by COSEWIC. Some errors in listing/assessment are noted throughout the EIS. The Roughhead Grenadier is Not at Risk under COSEWIC. Shortfin Mako (Atlantic population) is Special Concern under COSEWIC. Loggerhead Sea Turtle and Beluga Whale (St. Lawrence Estuary population) are Endangered under the SARA.	

	This information is important to accurately describe the marine fauna and to assess environmental effects of the Project
Request 15-Apr-19	A. Update EIS to include current assessment of roughhead grenadier (e.g., move information from Species at Risk sections). B. Correct listing/ assessment for shortfin mako (Atlantic population), beluga whale (St. Lawrence Estuary population), and Loggerhead sea turtle.
Equinor Response 15-Nov-19	A. The EIS will be amended to reflect the correct listing status of Roughhead Grenadier. The following updates will be made to the EIS: Section 6.1.8.5 – Grenadiers (Common, Roundnose, Roughhead) "Roundnose ~~and roughhead grenadiers~~ are listed as Endangered ~~and Special Concern~~ by COSEWIC ~~respectively~~ (COSEWIC ~~2007a,~~ 2008)." Table 6.31 - Row 6 – Roughhead grenadier – will be removed from the table. Section 6.1.9.8 -Roundnose Grenadier ~~(Roundnose and Roughhead)~~ "Roundnose ~~and roughhead~~ grenadiers are listed as Endangered ~~and Special Concern, respectively,~~ by COSEWIC. Distribution, biology and ecology for ***this*** ~~these~~ species are described in Section 6.1.8.5. Critical habitat has not been established for ~~the~~ roundnose grenadier due to lack of information of habitat associations in relation to life history stages (DFO 2010). ~~Critical habitat has not been established for roughhead grenadier, however spawning grounds for this species are suggested to lie on the southern and southeastern slopes of the Grand Banks outside the Project Area (Scott and Scott 1988; COSEWIC 2007a~~)." B. The EIS will be amended to reflect the correct listing / assessment status of Shortfin Mako (Atlantic population), Beluga Whale (St. Lawrence Estuary population), and Loggerhead Sea Turtle. Section 6.1.9.4 will be amended to read as: "Under COSEWIC, basking shark are listed as Special Concern, shortfin mako sharks ***and porbeagle are listed as Endangered***." Table 11.6 will be updated with the following edits: Table 11.6 Marine Mammals and Sea Turtle Species at Risk: Analysis of Potential Environmental Interactions and Effects.

Species	SARA Schedule 1 Status	COSEWIC Designation	Summary and Presence of Potential Interactions / Effects
Beluga whale (St. Lawrence Estuary population)	***Endangered***	Endangered	• Considered rare in the Project Area and LSA, with more frequent occurrences in the eastern and southern RSA. Most likely to occur in the RSA during spring to fall. • Low potential for interaction with Project activities given rare occurrence in the Project Area • Proposed mitigation will reduce risk of effects from underwater sound

					(i.e., seismic surveys, geohazard surveys, VSP), discharges, and supply and servicing
		Loggerhead sea turtle	***Endangered***	Endangered	• Considered rare in the Project Area and LSA, with more frequent occurrences in the southern RSA. Most likely to occur in the RSA during spring to fall. • Low potential for interaction with Project activities given rare occurrence in the Project Area. • Proposed mitigation will reduce risk of effects from underwater sound (i.e., seismic surveys, geohazard surveys, VSP), discharges, and supply and servicing

IR-92 **DFO-8**	**Guideline Ref:** Part 2, Section 7.1.5	**EIS Ref:** Section 6.1.9
Context/Rationale	Based on Table 6.31 in Section 6.1.9 of the EIS, lumpfish, cusk, smooth skate, winter skate and spiny dogfish are species at risk with potential to overlap the Project Area; however, these species are not further described in Section 6.1.9. This information is important to accurately describe the marine fauna, to understand habitat requirements, and to understand threats to species at risk to assess environmental effects of the Project	
Request **15-Apr-19**	Update Section 6.1.9 to include all species at risk with potential to overlap the Project Area and update effects assessment, as necessary.	
Equinor Response **15-Nov-19**	The potential for lumpfish, cusk, winter skate and spiny dogfish to occur in the Project Area exists. However, the likelihood of occurrence is either low or not likely to affect the population as detailed below. Smooth skates that would be present in the Project Area are from a population currently listed by COSEWIC as Data Deficient. The Project Area is not important habitat for any of these species and represents the edges of their respective ranges with the exception of the smooth skate. Therefore, these species are not further discussed in the EIS. For clarification the following text will be included in Section 6.1.9 of the EIS. "However, species range extents within the Project Area may not necessarily be areas of high utilization. These species are further described below in terms of their biology, ecology and distribution with some numerically dominant fish species of the area previously described in Section 6.1.8. ***Lumpfish, cusk, winter skate and spiny dogfish are unlikely to occur in the Project Area. The Project Area is not important habitat for these species and represents the edges of their respective ranges with the exception of the smooth skate. Smooth skates that would be present in the Project Area are from a population that are not listed by COSEWIC or SARA. Therefore, these species are not further discussed in the EIS.*** Additional biological information is described in the Eastern Newfoundland SEA (Amec 2014a)."	

IR-93 **DFO-10**	**Guideline Ref:** Part 2, Section 7.1.5	**EIS Ref:** Section 6.1.9; Table 6.31
Context/Rationale	The Laurentian-Scotian population of smooth skate is missing from Table 6.31 in Section 6.1.9 of the EIS. If "spring migration through and near the Project Area is possible" for the Outer Bay of Fundy population of Atlantic Salmon (Page 9-92), it is not clear why this population was not included in Table 6.31. Similarly, given that the Inner Bay of Fundy population of Atlantic Salmon is included in the effects assessment (Page 9-94), it is not clear why it is not included in Table 6.31. This information is important to accurately describe the marine fauna and habitats to assess environmental effects of the Project.	
Request **15-Apr-19**	A. Revise Section 6.1.9 of the EIS to include Laurentian-Scotian population of smooth skate in Table 6.31 and throughout the EIS, as appropriate. B. Provide the rationale why the Outer Bay of Fundy and Inner Bay of Fundy populations of Atlantic Salmon were not included in Table 6.31.	
Equinor Response **15-Nov-19**	A. Smooth skate are present within the Project Area from the Nose of the Grand Banks Population Designatable unit (DU) and Flemish Cap population. The Nose of the Grand Banks Population is listed by the COSEWIC as Data Deficient. Studies on smooth skate indicate that they have limited dispersal and significant interchange among DUs is considered unlikely (COSEWIC 2012). This is partly based on distribution of smooth skate catches from Canadian trawl surveys relative to sampling effort where this is complete absence of this species between the DUs (Figure 1, COSEWIC 2012, below). Dispersal is also considered limited among early life history stages as skate purses are deposited on the bottom (COSEWIC 2012). Smooth skate in the Project Area are not part of the Laurentian-Scotian population, therefore the Laurentian-Scotian population of Smooth skate will not be included in Table 6.31. Updates to the EIS are not required.  Figure 1: Left: Distribution of Smooth Skate catches in Canadian and US trawl surveys. Colour surface denotes density level of captures. Right: Distribution of sampling effort from Canadian and US trawl surveys from 1970-2009. Coloured dots show the DFO Regional and USA survey sets (COSEWIC 2012). B. The overwintering patterns are discussed in Section 9.4.5 of the EIS for Atlantic salmon from the Outer Bay of Fundy (oBoF) and Inner Bay of Fundy (iBoF) populations. Given the available data, there is a low potential for spring migration of	

	adults from the oBoF to interact with the Project Area. The oBoF population will be added to Table 6.31 (see amended Table 6.31 below). While the data available to determine habitat important for overwintering for all stages (November to April) are limited for iBoF salmon, overwintering is suggested to be off the Scotian Shelf or the southern portion of the Gulf of Maine (Lacroix 2013; CSAS 2016) and as a result, interaction with the Project Area is considered unlikely. Therefore, the iBoF salmon designatable unit does not need to be added to Table 6.31. Updates to the EIS for iBoF salmon are not required. References: COSEWIC. 2012. COSEWIC assessment and status report on the Smooth Skate Malacoraja senta in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xix + 77 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm). CSAS. 2016. Updated information on fishing bycatch of the Atlantic salmon, inner Bay of Fundy population and its impact on the survival or recovery of this Atlantic salmon designatable unit (DU). Canadian Science Advisory Secretariat Science Response 2016/023, Fisheries and Oceans Canada, Ecosystems and Oceans Science, Maritimes Region. Lacroix, G.L. 2013. Population-specific ranges of oceanic migration for adult Atlantic salmon (Salmo salar) documented using pop-up satellite archival tags. Canadian Journal of Fisheries and Aquatic Sciences, 70:1011-1030. https://doi.org/10.1139/cjfas-2013-0038.

Table 6.31 Marine Fish Species at Risk that are Known to or May Occur within the Project Area

Species		Status / Designation [1,2]				Relevant Population (Where Applicable)	Update from SEA 2014[3]
Common Name	Scientific Name	NL ESA	SARA	COSEWIC	IUCN		
Atlantic salmon[4]	*Salmo salar*			T, SC, E	LC	South Newfoundland, Quebec Eastern North Shore, Quebec Western North Shore, Anicosti Island, Inner St. Lawrence, Gaspe-Southern Gulf of St. Lawrence, Eastern Cape Breton, Nova Scotia Southern Upland, ***Outer Bay of Fundy Population (COSEWIC)***; Global (IUCN)	D

IR-94 / DFO-75	Guideline Ref: Part 2, Section 7.1	EIS Ref: Section 6.1.8.6, Table 6.30; Section 6.1.9.9
Context/Rationale	Section 6.1.8.6 and 6.1.9.9 of the EIS notes that EU RV surveys within Div 3M have indicated that Atlantic cod occur and spawn on the Flemish Cap. This should be reflected in Table 6.30 and on Page 6-141. This information is important to accurately describe the marine fauna and habitats to assess environmental effects of the Project.	

Request 15-Apr-19

A. Update Table 6.30 in Section 6.1.8.6, and other portions of the EIS, to accurately indicate occurrence and spawning of Atlantic cod on the Flemish Cap.

B. Update the effects assessment

Equinor Response 15-Nov-19

For clarification, the text in Section 6.1.8.5 – Atlantic Cod will be amended to read as:

> "Currently no critical habitat has been established for Atlantic cod; however, the Southeast Shoal and Tail of the Banks, Virgin Rocks, and Burgeo Banks EBSAs are considered important spawning areas for cod (Templeman 2007***, DFO 2016b). Spawning has also been observed on the Flemish Cap from late February to early April and peak spawning in March (Lilly 1987; ICES 2005). Atlantic cod on the Flemish Cap typically have a shorter and earlier spawning season relative to populations on the NL Shelf (ICES 2005).***"

Table 6.30 will be amended to include February, March and November spawning months and spawning areas (see below).

Additional information regarding this species does not change the effects assessment and the EIS conclusions remain valid.

References:

DFO. 2016b. Refinement of Information Relating to Ecologically and Biologically Significant Areas (EBSAs) Identified in the Newfoundland and Labrador (NL) Bioregion. DFO Can. Sci. Advis. Sec. Sci. Resp. 2016/032.

ICES. 2005. Spawning and life history information for North Atlantic cod stocks. ICES Cooperative Research Report, No. 274. 152 pp.

Lilly, G.R. 1987. Synopsis of research related to recruitment of Atlantic cod (Gadus morhua) and Atlantic redfishes (Sebastes sp.) on Flemish Cap. NAFO Sci. Coun. Studies, 11, 109-122.

Table 6.30 Spawning Periods and Locations of Some Key Fish Species

Common Name	Scientific Name	Eggs and/or Larvae	Spawning Time												Known Spawning Locations
			J	F	M	A	M	J	J	A	S	O	N	D	
Atlantic cod	*Gadus morhua*	P													Southeast Shoal and Tail of the Banks, ***Virgin Rocks, Burgeo Banks, Flemish Cap***

IR-95 / DFO-76	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6.1.9.11

Context/Rationale

Section 6.1.9.11 of the EIS provides information from EU RV Surveys that should be incorporated into this section as the lack of redfish species within the Core BdN Development Area may be more related to a lack of sampling effort in this area by Canadian RV Surveys. This information is important to accurately describe the marine fauna to assess environmental effects of the Project.

Request **15-Apr-19**	In Section 6.1.9.11 of the EIS incorporate information from EU RV Surveys for discussion of redfish presence and habitat requirements.
Equinor Response **15-Nov-19**	Distribution, biology and ecology for redfish species are described in Section 6.1.8.5 of the EIS. Information regarding presence and habitat will be included in the EIS as requested by DFO. Section 6.1.8.5 - Redfish will be amended to read as: Redfish (Acadian, Deepwater, Golden) "Three species of redfish have been captured within the Project Area during the Canadian and EU RV surveys, including Acadian, deepwater, and golden redfish. In the Canadian RV surveys, Acadian and deepwater redfish were the dominant redfish species captured and represented ***44*** percent of the total catch (Table 6.28; Figure 6-25). Redfish were primarily distributed on the shelf and slopes of the Grand Banks on the western side of the Project Area (Figure 6-25 and Figure 6-26). Redfish species were also well represented in the EU RV surveys, with the three species comprising over 90 percent of total catches on the Flemish Cap (Table 6.28). However, redfish in EU RV surveys were primarily distributed in shallower areas of the Flemish Cap with low occurrences in the Project Area (Figure 6-27 to Figure 6-29). ***Habitats for adult redfish are generally bank slopes and deep channels in relatively cold waters (5ºC) (COSEWIC 2010c).*** Both Acadian and deepwater redfish have wide depth ranges of 138 m to 1,200 m (Nogueira et al. 2017) with relatively high abundances beyond shelf depths (> 250 m). Golden redfish has the lowest depth range (130 m to 631 m) of the three species and was another key species in shallow slope assemblages on the Flemish Cap (Nogueira et al. 2017) (Figure 6-29). Smaller adult redfish tend to occupy shallower waters and may migrate to deeper waters as they grow (COSEWIC 2010c). Areas of concentration were largely on the slopes of the Grand Banks and the Flemish Cap with infrequent captures in the Flemish Pass ***(Román et al 2018). However, this may be due to lack of sampling effort from Canadian and EU RV surveys in the Flemish Pass rather than low abundances in the area. Redfish have historically been captured in the Flemish Pass as bycatch of the Greenland halibut fishery (Ávila de Melo et al 2018)***." References: ***Ávila de Melo, A.m., Alpoim, R., Gonzáles-Troncoso, D., González, F., and M. Pochtar. 2018. The Status of redfish (S. mentella and S. fasciatus) in Divisions 3LN at present and the likelihood its follow up in the near future (under the ongoing the Management Strategy or as a Status Quo TAC Scenario. Northwest Atlantic Fisheries Organization Scientific Council Research Document. 18/033. Serial No. N6822.*** ***Román, E., González-Troncoso, D., and M. Alvarez. 2018. Results for the Atlantic cod, roughhead grenadier, redfish, thorny skate and black dogfish of the Spanish Survey in the NAFO Div. 3L for the period 2003-2017. Northwest Atlantic Fisheries Organization Scientific Council Research Document. 18/018. Serial No. N6802.***

IR-96 **DFO-28**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 6
Context/Rationale	Inconsistencies are noted in Section 6.0 of the EIS. • In contradiction to the text (Page 6-14), Chl a concentrations appear higher south of the Flemish Cap and southeastern sections of the Grand Banks and are generally heightened in spring relative to winter based on Figure 6-4. • Inconsistencies are noted between the text (Page 6-19) and associated figures (Figures 6-5 and 6-6) for northern shrimp. Years of the surveys are different. The text indicates that northern shrimp were sampled in the Project Area; however Figure 6-6 does not show any catch in the Project Area. • The statement “In the Project Area, shrimp species were numerically dominant in the Project Area based on Canadian RV surveys. However, the abundance in the Project Area is relatively low compared to captures on the Northeast NL Shelf (Figure 6-5)” (Page 6-62); is inconsistent with Figure 6-5, which only depicts Northern Shrimp. • The statement that roughhead grenadiers have “relatively low abundances inside the Project Area” (Page 6-87) is inconsistent with Figure 6-21. • The spawning description for Greenland Halibut (Page 6-84) is inconsistent with Table 6.30. • The statement “northern wolffish had the highest abundance of the three species based on Canadian RV surveys” (Page 6-117) is inconsistent with Figures 6-35 to 6-37, which suggest that striped wolffish are the most abundant. • The statement “Sampling near the Flemish Pass in winter and summer/autumn captured no salmon (Reddin and Shearer 1987)” (Page 6-130) is confusing given that sampling did not appear to occur near the Flemish Pass during winter in Figure 6-42. This information is important to accurately describe the marine fauna and habitats to assess environmental effects of the Project.	
Request **15-Apr-19**	Ensure information presented in tables and figures is consistent with the text in Chapter 6.0.	
Equinor Response **15-Nov-19**	The following edits will be made to the EIS to address the inconsistencies noted by the reviewer. Section 6.1.5.1 “~~Overall~~ Winter concentrations of Chl a are higher in the southern Grand Banks and Flemish Pass south of the Flemish Cap (coinciding with an earlier spring bloom within the northern extension of the Gulf Stream) …During spring (March to May), the largest ***annual*** concentrations of Chl a shift to more northern latitudes and includes most of the Project Area (Figure 6-4).” Section 6.1.6 “Based on EU RV data collected during 2012 to 2015, northern shrimp are most concentrated on the Flemish Cap slope area ~~in the eastern portions~~ ***east*** of the Project Area (Figure 6-6)”. Section 6.1.7.7 “There are more than 30 shrimp species found off NL (Squires 1990, Amec 2014a). In the Project Area, ***Northern*** shrimp species were numerically dominant in the Project	

	Area based on Canadian RV surveys. However, the abundance in the Project Area is relatively low compared to captures on the Northeast NL Shelf (Figure 6-5).”

Section 6.1.8.5

“On the Flemish Cap, distributions available for roughhead grenadiers indicate that areas of concentration are on the deep slopes with relatively low ***to high*** abundances inside the Project Area (Casas and Gonzáles Troncoso 2015; Alpoim and González Troncoso 2016) (Figure 6-21).”

Table 6.30

With respect to the spawning period of Greenland Halibut, Table 6.30, page 6-112 will be amended to correct the spawning times to read as follows:

Common Name	Scientific Name	Eggs and/or Larvae	Spawning Time												Known Spawning Locations
			J	F	M	A	M	J	J	A	S	O	N	D	
Greenland Halibut	*Reinhardtius hippoglossoides*	P													Davis Strait, Flemish Pass

Section 6.1.9.1

“Northern Wolffish had the highest abundance of the three species ***in the Project Area*** based on Canadian RV surveys.”

Reddin and Shearer (1987) conducted winter sampling in the southern Flemish Pass. Figure 6-42 will be updated to reflect the winter sampling and is as follows:

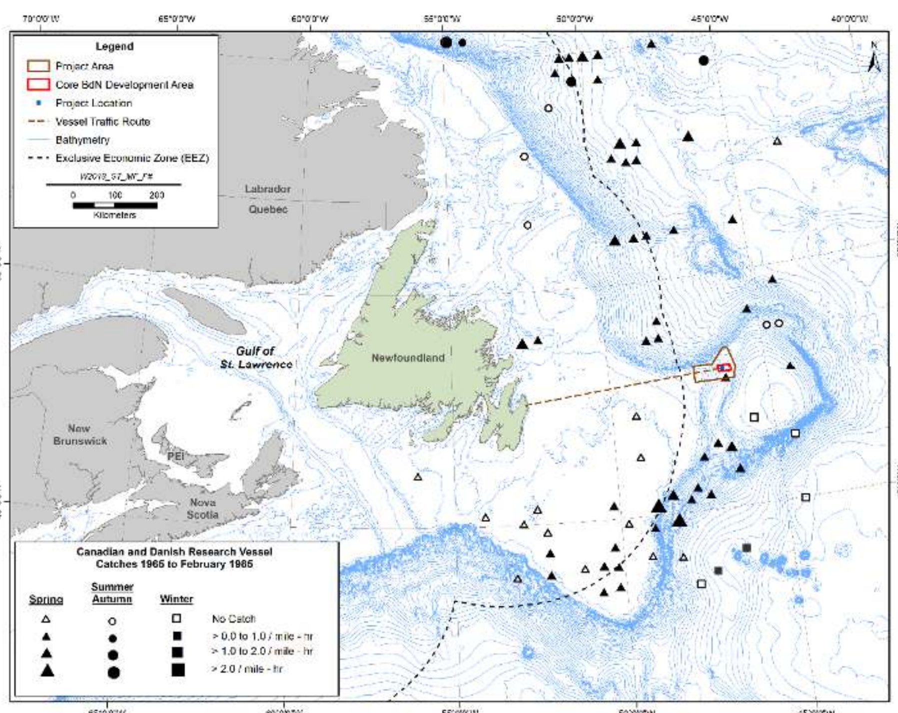


	Figure **Error! No text of specified style in document.**6-42 Atlantic Salmon Research Vessel Catches in the Northwest Atlantic Ocean (1965 to 1985)

IR-97 **DFO-78**	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 9.1.4, Appendix I
Context/Rationale	In Section 9.1.4 of the EIS, characteristics of the run scenario indicated as Nedwed (2004) were not provided. The statement "During drilling activities, cuttings discharges will likely be redirected to reduced accumulations, therefore the modelling approach is deemed very conservative to support the effects assessment." is unclear with respect to redirection. All the drilling waste dispersal scenarios assume single discharge point for each well or group of 8 wells. However, the proponent states that the drill cuttings will likely be displaced to reduce accumulations. If so, the drill cuttings pile will be lower but the cuttings will be spread over a larger area with a concomitantly larger zone of impact. Modelling a single discharge point is only "very conservative" for the height of the nearfield pile not for the size of the zone of effects. This information is needed to assess environmental effects of the Project.	
Request **15-Apr-19**	A. Describe Nedwed's (2004) characteristics of the cutting run scenario in Appendix I. B. Clarify if cutting discharges <u>will</u> be redirected or if they <u>may</u> be redirected at someone's discretion. C. Consider the influence of redirection in the evaluation of the modelling approach.	
Equinor Response **15-Nov-19**	A. Nedwed (2004) is a source of cuttings distributions for use in the absence of site-specific settling velocity data. The reference provided one more PSD input from the literature to consider. Information is provided in Appendix I, Section 3.2.The thickness values used in Appendix I refer to the median thickness of each individual simulation, for each of the five input PSD reported, not the median calculated across the five simulations. For clarity, the sentence in the Executive Summary of Appendix I – One Well Drilling Simulations will be modified to read as: "~~Based on all five input simulations,~~ ***The*** median total cuttings thickness ***for each of the five input simulations*** reaches the 6.5 mm PNET value at distances of 45 to 70 m from the wellsite and reach a PNET value of 1.5 mm at 70 to 90 m away." Regarding particle size ranges, the second paragraph of the Executive Summary notes "…drill cuttings are the small pieces of rock, ranging in size from coarse sand to fine silts and clays …" Given the three different cuttings particle size distributions (PSD) employed in the modelling, particle size ranges are presented in the model simulation inputs Section 3.2. B. As described in EIS s. 2.7.4.5, "The use of a cuttings transport system (CTS) will be determined during detail design stage of the Project and is often used to prevent the build-up of cuttings around the well template location" and is a possible mitigation to reduce potential impacts from drill cuttings discharges on benthic habitat (i.e., corals and sponges) (see response to IR-101/Conformity DFO-3). If a cuttings transport system were to be used, the discharge location would be between 30-150 m from the	

	well template location. During the detail design stage of the Project, a decision regarding the use of a CTS will be made. Updates to the EIS are not required. C. Cuttings dispersion modelling considered a 'point source' discharge at the seafloor. The location of the discharge location is not dependent on the use of a CTS. The location was the point of discharge, whether it was from a CTS or at the wellhead location. The coordinate chosen for discharge was in an identified FCA, a special area, in keeping with the 'worst-case' approach of the effects assessment analysis in the EIS. Updates to the EIS are not required.

IR-98 **DFO-144a**	**Guideline Ref:** Part 2, Section 7.3.1, Section 7.3.8.3	**EIS Ref:** Section 9.1.5.1, Table 9.6; Section 11.1.5.1, Table 11.4
Context/Rationale	It is not always obvious why potential environmental effects were not selected for certain project components/ activities throughout Section 9.0 of the EIS. Examples are below. In Table 9.6, change in fish and invertebrate mortality, injury, health is not selected for Offshore Construction and Installation, and HUC for potential future development, but is selected for Core BdN Development Activities. Based on Table 9.6, behavioural effects on fish and invertebrates are possible for marine discharges associated with HUC activities, but in Table 11.4, change in prey availability or quality is not selected.	
Request **15-Apr-19**	A. Provide the rationale for selection of potential environmental effects in Table 9.6 of the EIS that do not appear to be consistent between the Core BdN Development Project and future development activities which are described as being the same. B. Provide the rationale for the differences in potential effects in Project activities between interrelated VCs throughout the EIS.	
Equinor Response **15-Nov-19**	A. For clarity regarding the selection of Project-VC interactions the following text will be added to Section 9.1.5.1. "An overview of the potential for interactions between each of the Project's planned components and activities and Marine Fish and Fish Habitat, and specifically, the potential for these to result in environmental changes and detectable effects to the various aspects of this VC, is presented in Table 9.6. ***In accordance with Part 2, Section 3.2 of the EIS Guidelines, the effects assessment of project activities is based on those discharges/activities "with the greatest potential to have environmental effects." This is based on scientific literature, research studies, Indigenous knowledge, input from Indigenous groups and stakeholders, and professional experience of the EIS team. Most Project activities have the potential to interact with Marine Fish and Fish Habitat. Only air emissions associated with Production and Maintenance and Drilling Activities and sound related to helicopter use during Supply and Servicing were determined to have no discernible effects and are therefore not identified as interactions.*** The effects assessment focusses on identified interactions. Where interactions are not identified in the table, there will be no discussion in the relevant effects analysis section." B. Interactions for each VC are discussed in each subsequent VC chapter (i.e., Chapter 9 for Fish and Fish Habitat, Chapter 11 for Marine Mammals and Sea Turtles). Equinor Canada reviewed the interactions regarding HUC activities and acknowledge	

that there is an interaction in terms of prey availability and HUC activities. Table 11.4 will be amended as follows:

Table 11.4 Potential Project-VC Interactions and Associated Effects: Marine Mammals and Sea Turtles

Project Component / Activity	Potential Environmental Effects			
	Change in Injury and/or Mortality Levels	Change in Habitat Quality and Use	Change in Prey Availability or Quality	Change in Health
HUC Activities				
• Marine Discharges			✓	

The following text will be added to Section 11.2.1.1.

"<u>HUC Activities</u>
Any behavioural responses by fish/invertebrates (i.e., change in presence/abundance) in response to marine discharges during HUC activities (i.e., flushing of flowlines with anti-bacterial solutions and/or biocides) which would impact prey availability (see Section 9.2.1.2) would be low in magnitude and limited to a localized area."

Additional information regarding Project Activities-VC interactions for Marine Mammals and Sea Turtles is provided in responses to IR-144/DFO (21,109, 145, 150, 153, 162) and IR-151/DFO-91

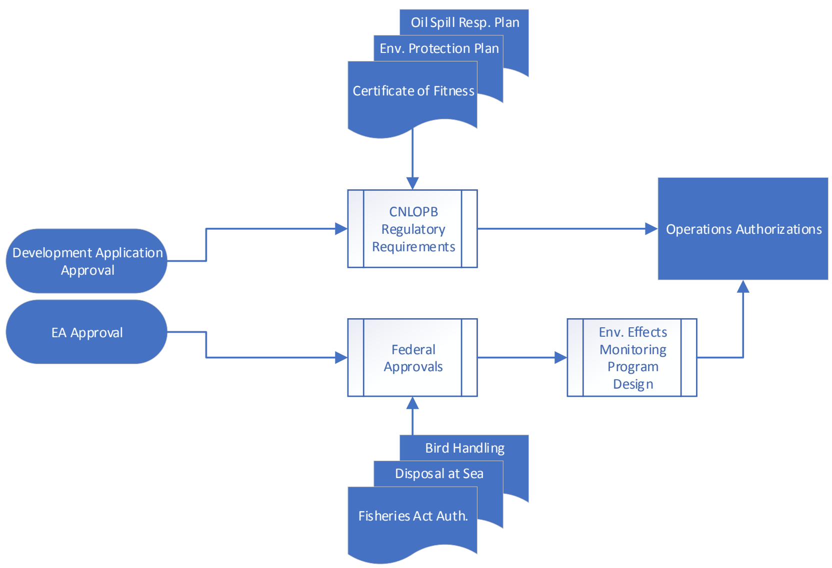
IR-99 **CEAA-31**	**Guideline Ref:** Part 1, Section 4.3	**EIS Ref:** Section 9.1.5.1, Section 9.2.1, Section 9.2.6
Context/Rationale	Section 9.1.5.1 of the EIS states "Direct and indirect adverse effects on Marine Fish and Fish Habitat including population level effects that could be caused by Project activities include, but are not limited to: change in habitat availability and quality; change in food availability and quality; change in fish and invertebrate mortality, injury, heath; change in fish and invertebrate presence and abundance.". The effects analysis in the EIS did not fully describe these specific effects based on the literature review on effects or the specific ecosystems in the Core BdN Development Area and Project Area. In Section 9.2.1 of the EIS, very little of the information in Sections 5 and 6 was applied to the effects analysis. For example Section 6.1.7 in the EIS acknowledges "predator-prey relationships, substrate type and associations with habitat engineering organisms (e.g., corals and sponges)". Biological systems in the deep-sea operate at a notably slower pace than in shallow waters. Many deep-sea species typically have low metabolic rates, are slow growing, and have late maturity, low levels of recruitment, and long life spans relative to their shallow water counterparts. "Many benthic deep-sea invertebrate species are… regarded as being sensitive to anthropogenic disturbance. In most deep-sea ecosystems, recovery can be very slow." Section 6.1 of the EIS states "Marine ecosystems comprise biological and physical elements that interact to form complex and variable patterns across a seascape". Section 6.1.2 of the EIS provides a broad overview of food web and community structure. This information was not included in the effects analysis in Section 9 of the EIS.	

	Section 6.1.3 of the EIS “Within depth zones, habitat complexity and the intensity of fishing can further segregate faunal communities. Identified elevated species richness, abundance and biomass of taxa are indicative of Vulnerable Marine Ecosystems (VMEs) within sponge grounds and in areas closed to fishing. Similarly, some species of fish are also known to specifically occupy complex habitats.” The description of the benthic effects in Section 9 does not address the ecosystem effects in a holistic manner in the zones of influence or detectable changes above natural variability. The focus is on corals, sponges and seapens and no other benthic organism or the community. This section is based on global research findings, but not applied, if relevant, to the benthic communities in the Flemish Pass in the Core BdN Development Area or the Project Area. The use of site specific information is required to assess relevant environmental effects of the Project. Section 6.1.5 of the EIS on plankton states “Physical environmental parameters can elicit large-scale responses in the composition and dynamics of pelagic species assemblages (Johnson et al. 2014). However, species may also be influenced by their local adaptations and ecological roles, including foraging ecology and plasticity, trophic level, physiological tolerances, life history mode and developmental stage”. Changes on these ecological processes was not included in the effects analysis in Section 9 of the EIS. Section 6.1.7 of the EIS discusses benthic invertebrates and states “these organisms have key roles in ocean ecosystems. Invertebrates enhance habitat complexity, influence nutrient cycling and biochemical processes, and are a critical component of the benthic food web”. This information was not included in the effects analysis in Section 9. Potential environmental effects should describe how the changes in valued ecological processes of the marine ecosystem that may be affected by the potential environmental changes induced by the project.
Request 15-Apr-19	A. To substantiate the significance of effects ratings in Sections 9.2.1 to 9.2.6 of the EIS, describe the potential changes in habitat availability and quality, changes in food availability and quality, changes in fish mortality, injury and health; and changes in fish presence and abundance affects, related to ecological value, within or beyond natural variability for the habitats and marine fauna inhabiting the zones of project influences for each interaction by project activity under each project phase. B. Describe the zone of influence upon the specific benthic community based on the baseline seafloor surveys predicted to be affected by subsea infrastructure installation in an ecosystem approach. C. Based on the baseline survey, area specific fish population data, and water quality and sediment quality data, describe natural variability in pelagic and benthic communities and habitats in the Core BdN Development Area and Project Area. D. Describe the linkages between environmental effects observed in research as cited in the EIS, with the specific marine communities, biotic and abiotic information provided Sections 5 and 6, and with the zones of influence from Project activities in the Core BdN Development Area and Project Area.
Equinor Response 15-Nov-19	A. Refer to response to IR-32/Con DFO-1 B. Refer to responses to IR-107/CEAA-36, IR-109/CEAA-37 Part A, IR-112/DFO-81a;CEAA-41, IR-124/CEAA-54. C. See response to IR-109/CEAA-37 Part B

	D. See response to IR-109/CEAA-37 Part C

IR-100 **CEAA-32**	**Guideline Ref:** Part 1, Section 4.3	**EIS Ref:** Section 9.1.5.1, Table 9.6
Context/Rationale	In Section 9.1.5.1 of the EIS, it states that the FPSO will be onsite for the Hook-up and Commissioning, but it is not included in the project component column of Table 9.6. Under Production and Maintenance Operations, additional vessels or MODU required for well workover, and/or well intervention, activities are not included. With more vessels, and/or a MODU, there is more sound, lights and waste discharges. This information is needed to support an assessment of cumulative effects within the Project as several of the project activities overlap (simultaneous operations). Components of the decommissioning activity are not listed.	
Request **15-Apr-19**	Revise the EIS accordingly to ensure all emissions and discharges are understood and an assessment of intra-project cumulative effects is completed.	
Equinor Response **15-Nov-19**	The presence of the FPSO on site is addressed in Section 9.2.2. During HUC activities, at this stage the FPSO is considered a vessel and the activities associated with hook-up and commissioning of the FPSO are assessed in Section 9.2.1.2. As HUC activities are considered temporary, the longer-term interactions of the FPSO on-site during production activities are addressed in Section 9.2.2. Decommissioning activities are described in Section 2.6.7. Potential effects on fish and fish habitat are addressed in Section 9.2.6 and 9.3.6. Additional clarification is provided in response to IR-132/NRCan-66. Regarding intra-Project effects, presence of vessels and emissions and discharges associated with simultaneous activities, see responses to IR-8/C-NLOPB-3;CEAA-2 (Parts B and C), IR-13/CEAA-6;DFO-1 (Part H) and IR-219/Conformity DFO-4.	

IR-101 **Conformity DFO-3**	**Guideline Ref:** Part 2, Section 7.4	**EIS Ref:** Page 9-20, Section 9.1.5.2; Page 9-28, Section 9.2.2.2
Context/Rationale	The EIS Guidelines require that mitigation measures be written as specific commitments that clearly describe how the proponent intends to implement them. Clarity regarding mitigation measures is lacking. For the statement "Equinor Canada will collect fish habitat and/or coral and sponge data in areas where data may be deficient." (Page 9-20), it is not clear how deficiencies will be determined. Regarding the statement "Produced water will be treated using best treatment practices that are commercially available and economically feasible and discharged to the marine environment." (Page 9-28), it is unclear when the best commercially available practices are economically unfeasible. Best treatment practices that are commercially available and economically feasible should be described.	
Request **10-Jun-19**	Provide fulsome descriptions of the activities to be undertaken as mitigation measures throughout the EIS and clearly indicate how the proponent will ensure commitment to their application.	

Equinor Response 15-Nov-19	Environmental assessment is a planning tool in project development, whereby the potential effects of a project are assessed and mitigations, which would be implemented in project design and operations, are identified. Environmental assessment is one requirement of the regulatory process to obtain the necessary permits, authorizations, licences, etc. As discussed in Chapter 1, there are many regulatory requirements for the BdN Development Project. Once the environmental assessment is complete, Equinor Canada must then obtain all the necessary permits, licences, authorizations, etc., over multiple phases of the Project. To provide clarity for the reader the following text and figure will be added to Section 1.3.4 of the EIS. "A list of some of the key legislation, regulations and associated approvals that may be required in relation to offshore oil and gas activities are provided in Table 1.1. A reference in the EIS to legislation, regulations or guidelines refers to such legislation, regulations or guidelines as amended from time to time over the life of the Project. ***Figure 1.# illustrates the regulatory approval process for the Project."***  Mitigation measures are listed in the upfront sections of each VC chapter. For clarity, the interaction tables for each VC chapter (Tables 9.6, 10.6, 11.6, 12.6, 13.6) will include a column identifying the mitigation measure that are applicable to each activity. An example of an updated interactions table is provided in Appendix F to this report. Therefore, where it is stated in the effects assessment of a particular VC "with the application of mitigation measures" it means the list of mitigation measures identified in the interactions table relating to that VC (for instance Table 9.6). Equinor Canada does not agree with the reviewer's statement that the mitigation measures are not written as specific commitments. With the exception of the mitigation discussed below, mitigations listed are direct commitments with language such as "will be developed" "will be implemented", "will be inspected" or "will be treated." Similar language was used in the recently approved Flemish Pass Drilling EIS (Equinor Canada 2017). For those mitigations that may not be written as specific commitments because Project design is ongoing, the mitigation measure is written to indicate that there is more than one option under consideration. For instance, in Section 9.1.5.2 and Section 12.1.5.2 the mitigation measure "to reduce potential impacts to fish habitat may include relocation of subsea infrastructure, relocation of the subsea templates and/or use of subsea cuttings transport system" provides options to reduce potential impacts on benthic invertebrates, including

	vulnerable marine habitat. A definitive statement cannot be provided as design is ongoing and it is unknown which option (or options) may be chosen. In addition, based on final design, mitigations may not be required. Therefore, such statements allow for flexibility, but at the same time, indicate Equinor's commitment to implement mitigations, if required. However, for clarity, the Section 9.1.5.2 of the EIS will be amended to read as • ***"With regards to subsea layout, well templates will not be placed over Lophelia pertusa corals*** • ***Discharge locations for water-based cuttings, when cuttings transport system is used, will be determined based on the C-NLOPB requirements to avoid Lophelia pertusa complexes and/or assemblages of 5 or more corals in 100 m² with heights greater than 30 cm within 100 m of the discharge location."*** With regard to the following mitigation listed in Section 9.1.5.2 of the EIS: "Once final layout of subsea infrastructure is confirmed and if locations of infrastructure have changed from the base case, Equinor Canada will collect fish habitat and/or coral and sponge data in areas where data may be deficient". While not a mitigation per se, the information was provided to indicate the possible requirement to collect additional data. As indicated in Chapter 6 of the EIS, Equinor Canada conducted a coral and sponge survey of the Core BdN Area in 2018. This survey, as described in Sections 6.1.1.5 and 6.1.7.5, collected coral and sponge data in areas where subsea infrastructure may be installed using a preliminary subsea infrastructure layout based on preliminary design. As indicated in the EIS and explained at the regulatory workshop in May 2019, Project design is ongoing. Once the subsea layout is finalized, the area occupied by the final layout design will be compared against the layout used in the 2018 survey. Based on the final design, if there are areas where subsea infrastructure will be installed on the seafloor that were not captured by the 2018 survey, these areas will be surveyed to collect coral and sponge data. Furthermore, additional benthic habitat data may be required to support of a *Fisheries Act* Authorization (if required) where DFO determines that the installation of subsea infrastructure results in a harmful alteration, disruption or destruction (HADD) of fish habitat. The following mitigation will be added to Section 9.1.5.2 of the EIS: • ***"Where Project activities may affect fish habitat and it is determined by DFO to be a habitat alteration, disruption and destruction (HADD), a habitat compensation program will be developed in conjunction with DFO as a mitigation measure for the net loss of fish habitat resulting from the Project."*** Upon review of the list of mitigations, mitigtions listed in other chatpers that also apply to fish and fish habitat were missing from the list. The following mitigations will be added to Section 9.1.5.2: • ***"Appropriate procedures will be implemented for the handling, storage, transportation, and onshore disposal of solid and hazardous waste.*** • ***At the time of decommissioning a well, the well will be inspected in accordance with applicable regulatory requirements"*** The mitigation "Once final layout of subsea infrastructure is confirmed and if locations of infrastructure have changed from the base case, Equinor Canada will collect fish habitat and/or coral and sponge data in areas where data may be deficient" will be deleted from the list of mitigations. For clarity, the following text will be added after the list of mitigation in Section 9.1.5.2 of the EIS.

	"Upon completion of final subsea layout design, the area occupied by the final layout design will be compared against the layout used in the 2018 survey. Based on the final design, if there are areas where subsea infrastructure will be installed on the seafloor that were not captured by the 2018 survey, these areas will be surveyed to collect coral, sponge and/or sea pens data. The survey methodology and plan will be provided to DFO in advance of survey commencement date for review and acceptance. In addition, if DFO determines a Fisheries Act Authorization is required regarding the harmful alteration, disruption or destruction (HADD) of fish habitat resulting from Project activities, additional fish habitat data may be required in support of the authorization." With respect to use of best treatment practices for produced water, a discussion of the proposed best treatment package for produced water is provided in Section 2.7.1.5 of the EIS and is not repeated in each VC Chapter. As stated in Section 2.10.5 of the EIS, the EPP or EPCMP will include a list of all mitigations included in the EIS. The EPP/EPCMP is regulatory requirement pursuant to Section 6(e) of the Newfoundland Offshore Petroleum Drilling and Production Regulations and will be submitted to the CNLOPB during the OA application process. The EPP/EPCMP also requires a description of how Equinor Canada will monitor compliance with the plan. As stated throughout the EIS and further clarified in response to IR-197/Conformity DFO-2, a follow-up monitoring program will be undertaken with a key objective to verify the efficacy of mitigation measures.

IR-102 **CEAA-33**	**Guideline Ref:** Part 2, Section 3.1, Section 7.1.2	**EIS Ref:** Section 9.1.5.2
Context/Rationale	In Section 9.1.5.2 in the EIS, mitigation measures may include use of a subsea cuttings transport system which can redistribute water-based mud and cuttings 500 m from the well template. It is unclear from the modeling if the point source release of mud and cuttings considered the scenario of this 500 m redirection of cuttings. As per Section 7.1.2 of the Guidelines "The EIS will describe the marine environment within areas that could be affected by routine project operations or by accidents and malfunctions". As per Section 7.1.3 of the Guidelines "The EIS will describe fish and fish habitat within areas that could be affected by routine project operations or by accidents and malfunctions". The predicted zone of influence is the basis for determination of effects on the benthic environment.	
Request **15-Apr-19**	A. Clarify the modeled scenarios for the drill waste release point modeled from the preferred drilling location / template if the cutting transport system was used or not. B. If not, describe the fate and effects of drill waste using the subsea cuttings system. C. Identify data and knowledge gaps throughout the EIS as required in the Guidelines.	
Equinor Response **15-Nov-19**	A. The Cutting Treatment System (CTS) was used for height of release as noted in the drill cuttings modelling, Appendix I, Table 3.2, "3. WBM cuttings from conductor and surface sections are released estimated at 0.2 m above the seabed assuming a CTS employed with 10" (0.25 m) outlet hose resting on the seabed, both for single well and for template drilling." Cuttings dispersion modelling considered a 'point source' discharge at the seafloor. The location of the discharge chosen is not dependent on	

	the use of a CTS. The location was the point of discharge, whether it was from a CTS or at the wellhead location. The (latitude, longitude) coordinate chosen for discharge was in an identified Fisheries Closure Area FCA, a special area, in keeping with the 'worst-case' approach of the effects assessment analysis. B. The EIS is complete. The fate and effects of drill cuttings discharges are described in Appendix I and Sections 9.1.4 and 9.2.3.2, which includes potential zones of influence associated with Project activities. With regard to benthic habitat information, a detailed coral and sponge survey was undertaken in 2018, the results of which are summarized in the EIS (see Section 6.1.7.5). See responses to IR-101/Conformity DFO-3 and IR-126/CEAA-56 regarding updating the EIS to provide additional coral and sponge survey data. C. EIS conclusions are evidence based, using all available information as described in Section 4.3.3. Uncertainties associated with predictions are noted in the EIS.

IR-103 **CEAA-34**	**Guideline Ref:** Part 2, Section 3.1	**EIS Ref:** Section 9.1.5.2
Context/Rationale	In Section 9.1.5.2 of the EIS there are no details regarding the "best treatment practices that are commercially available and economically feasible". Such information is required for the Agency to assess whether waste discharges will improve above the OTWG.	
Request **15-Apr-19**	A. In Section 9.1.5.2 of the EIS clarify whether the minimum standards for waste discharge that Equinor will meet are those listed under the OWTG B. Clarify whether Equinor will utilize any other treatments.	
Equinor Response **15-Nov-19**	Treatment options for waste discharges, where available, are discussed in Section 2.8 of the EIS. As indicated throughout the EIS, discharges will be treated to meet all applicable legislative and regulatory requirements, including the OWTG. In accordance with the OWTG and where applicable, discharges will be treated using best treatment practices that are commercially available and economically feasible before being released overboard. The Project's EPP, as required by the OA, will provide details regarding the management of wastes, discharges and emissions for the Project. The EPP will be prepared in accordance with the Drilling and Production Regulations and associated guidelines and submitted to the C-NLOPB for acceptance as a requirement of the OA application process. As described in Section 2.7.5, all chemicals that may be discharged will be screened in accordance with C-NLOPB guidance, with the goal of choosing chemicals that once discharged a sea would have the least effect on the environment. The chemical selection and management process will be included in the EPP. Updates to the EIS are not required.	

IR-104 **CEAA-35**	Guideline Ref:	**EIS Ref:** Section 9.2.1.1
Context/Rationale	In Section 9.1.5.2 of the EIS, the specific international regulatory requirements for sewage and food waste disposal at sea are not identified nor is there a description of where they will be applied. There is no comparison of OWTG and international regulatory	

	requirements to assess if one regulations is more stringent and better for water quality in the receiving environment.
Request 15-Apr-19	A. Provide the specific international regulatory requirements for sewage and food waste disposal at sea; under what situation are they applied; and how Equinor will comply. B. Explain the difference in the OWTG and international requirements in reducing effects on receiving water quality.
Equinor Response 15-Nov-19	Any discussion of specific international regulatory requirements for sewage and waste disposal at sea is beyond the scope of the Guidelines. Section 1.4 of the Guidelines requires the proponent to identify "any legislation and other regulatory approvals that are applicable to the project at the federal, provincial, regional and municipal levels". As indicated throughout the EIS, discharges will be treated in compliance with all applicable legislative and regulatory requirements, including the OWTG. Vessels are subject to the requirements of MARPOL. A comparison of any differences between domestic and international standards respecting waste disposal is not relevant to the environmental assessment of the Project and does not change the effects assessment. Updates to the EIS are not required.

IR-105 **DFO-19**	Guideline Ref:	**EIS Ref:** Section 9.1.5.2, Table 12.8, Table 12.9
Context/Rationale	In Section 9.1.5.2 and Tables 12.8 and 12.9 in the EIS, it is unclear how "layout design will take into consideration coral /sponge survey data" or what conditions will result in mitigation measures being used (i.e., to reduce potential impacts to fish habitat may include relocation of subsea infrastructure, relocation of the subsea templates and / or use of subsea cuttings transport system).	
Request 15-Apr-19	A. Discuss what parameters will be used to finalize mitigation measures and how measures will reduce or avoid impacts to fish and fish habitat. B. Update effects assessments, as necessary.	
Equinor Response 15-Nov-19	A. See response to IR-101/Conformity DFO-3. B. The EIS is complete. Updates to the EIS are not required	

IR-106 **DFO-79**	**Guideline Ref:** Section 3.1	**EIS Ref:** Section 9.2.1.1
Context/Rationale	For the statement in Section 9.2.1.1 of the EIS "Should protection measures be required, installation of subsea infrastructure protection may include activities such as rock placement, trenching and/or installation of concrete mattresses", it is unclear when protection measures may be required.	
Request 15-Apr-19	Describe scenarios which would require protection measures.	
Equinor Response 2-May-19	Equinor Canada responded to this IR in May 2019. The following information was provided:	

	This information is provided in EIS Section 2.6.1.2 where it states "The need for protection of the subsea infrastructure (well templates and flowlines / umbilicals / cables) from dropped objects or other interference will be assessed. " This determination is made during final project design stages. *Updates to the EIS are not required.*
DFO Response 10-Jun-19	Response is adequate

IR-107 **CEAA-36**	Guideline Ref:	**EIS Ref:** Section 9.2.1.1
Context/Rationale	In Section 9.2.1.1 of the EIS, the suction pile driving was not well described in terms of the amount of sediment to be removed and dumped; how long that operation would take for the installation of the well templates, riser bases, and moorings; where the sediment is to be deposited for each of the installation units; the volume and dispersion of suspended solids released into the water column; and the potential habitat loss from both suction dredge areas and at the deposition site. The zone of influence from suction dredging was not estimated. Information on multiple sources of suspended solids from sediment movement and rock dumping / mattress placement is needed for assessing effects on sensitive receptors and habitat and assessing potential cumulative effects. The Hook Up and Commissioning (HUC) activities are considered to have “some resuspension of sediments” effects that are similar to effects of site preparation and installation of subsea infrastructure. These HUC physical effects were not quantified to substantiate the conclusion about changes in habitat and direct or indirect effects on marine fauna. This information is needed for assessing environmental effects of the Project.	
Request 15-Apr-19	A. Describe the potential effects on benthic habitats (sediment and water) and fish from suction dredging activities and Hook Up and Commissioning activities that generate suspended sediments. B. Provide the anticipated zones of influence and expected habitat loss calculations from suction dredging and HUC activities. C. Revise the assessment of effects to include cumulative effects from multiple sources of seafloor disturbances from all project activities	
Equinor Response 15-Nov-19	A/B Project activities including durations of phases are presented in Chapter 2 of the EIS. Suction dredging is not an activity that is included as part of planned Project activities; however suction pile driving will be used to install subsea infrastructure. As described in Section 2.6.1.2 of the EIS, suction pile driving involves the driving of a sealed cylinder into the seabed. As the cylinder is driven into the seabed, water, along with disturbed sediment is extracted and deposited on the seabed adjacent to the cylinder. It is estimated that it can take up to 12 hours to install each suction anchor. Project design is ongoing and the size of the cylinders for the subsea infrastructure is not known. For clarity the following information will be added to Section 2.6.1.2 “The suction pile driving concept consists of a large diameter cylinder sealed at the top end and the open end is driven into the seabed by extracting water from the cylinder internals. ***As the cylinder is driven into the seabed, water, along with disturbed sediment is extracted and deposited on the seabed adjacent to the***	

	cylinder. It is estimated that it may take up to 12 hours to install each suction anchor." The effects of suspended sediments, which may result from suction pile driving and other activities, on benthic habitats is described in Section 9.2.1.1 of the EIS. The potential effects (e.g., material fluxes) of placement of subsea infrastructure are generally limited to <15 m (Heery et al. 2017). Considering the localized nature of potential effects and distance between suction anchors associated with subsea infrastructure (i.e., based on preliminary design, drill templates are at a minimum 1,153 m apart, FPSO moorings are 125 m apart), it is unlikely there will be potential overlapping effects. Furthermore, the artificial structures provide colonization habitat for sessile benthic organisms (See IR-112/DFO-81a; CEAA-41). In a study of disposal of native dredged material on the Grand Banks there were effects observed on sediments and benthic and demersal species initially after ocean disposal (Edgell et al. 2019). However, conditions were similar to reference stations at the end of the study after three years (Edgell et al. 2019). For clarity the following text will be added to Section 9.2.1.1 of the EIS: "The soft coral *Gersemia rubiformis* has also been shown to be resistant to mechanical disturbance such as crushing, with only temporary impairments to colony retraction and expansion (Henry et al. 2003). ***In a study of disposal of native dredged material on the Grand Banks there were effects observed on sediments and benthic and demersal species initially after ocean disposal (Edgell et al. 2019). However, conditions were similar to reference stations at the end of the study after three years (Edgell et al. 2019)…*** …Increased suspended particles in the water column could increase turbidity, potentially reducing visual cues for predator-prey interactions (De Robertis et al. 2003; Higham et al. 2015). ***If DFO determines that a Fisheries Act Authorization is required respecting the harmful alteration, disruption, or destruction (HADD) of fish habitat associated with the installation of subsea infrastructure, a fish habitat compensation program will be developed in conjunction with DFO as a mitigation measure of the net loss of fish habitat.*** Underwater sound associated with installation of subsea infrastructure would also likely result in temporary avoidance of the area by mobile fish and invertebrate species (see Section **Error! Reference source not found.**)." With the above amendments to the effects assessment regarding reversibility of benthic habitat to disturbances, the duration of effect would be medium-term. The text in Section 9.2.1.3 will be amended to read as: "In summary, with the application of mitigation measures, the residual environmental effects on Marine Fish and Fish Habitat resulting from offshore construction and installation are predicted to be adverse, low in magnitude, localized, ~~short-term~~ ***medium term*** in duration, occurring regularly when these activities are ongoing, and reversible. This prediction is made with a high level of confidence." The following text will be added to Section 9.5.1 of the EIS "The positive effects would last for the length of the Project activity, but combination of increased colonization opportunities and local enrichment may support faster recovery in an otherwise slow recovering environment. ***If DFO determines that a Fisheries Act Authorization is required respecting the harmful alteration, disruption, or destruction (HADD) of fish habitat associated with the installation of subsea***

	infrastructure, a fish habitat compensation program will be developed in conjunction with DFO as a mitigation measure for the net loss of fish habitat." C. See response to IR-13/CEAA-6; DFO-1 respecting intra-Project effects. References: ***Edgell, T.C., Molloy, P., Wiese, F., Skinner, M., and B. Wicks. 2019. A comparison of monitoring endpoints for seafloor impact and recovery following industry-scale dredge disposal on the Grand Banks [Abstract]. In Benthic Ecology Meeting 2019, April 3-6, 2019, St. John's, NL, Canada***.

IR-108 **DFO-80**	**Guideline Ref:** Part 2, Section 7.5	**EIS Ref:** Section 9.2.1.3
Context/Rationale	It is not clear how the statement in Section 9.2.1.3 of the EIS "residual environmental effects on Marine Fish and Fish Habitat resulting from offshore construction and installation are predicted to be…reversible" is applicable to protection measures such as rock placement, trenching or concrete mattresses.	
Request **15-Apr-19**	Provide a rationale on how effects from protection measures are reversible, or update the EIS accordingly.	
Equinor Response **15-Nov-19**	Reversibility, as defined in Table 4.5 of the EIS is "the ability of an environmental component to return to an equal or improved condition once the disturbance(s) that caused it has ended". Should protection measures be required, installation of subsea infrastructure protection may include activities such as rock placement, trenching and/or installation of concrete mattresses. Overall effects will be dependent on decommissioning strategies regarding the removal or abandonment of subsea infrastructure and/or protection measures. The presence of subsea protection measures would likely provide invertebrate colonization substrate in an environment that is dominated by fine substrates as discussed in Section 9.2.1 and Section 9.2.2 of the EIS. Removal of these structures as described in Section 9.2.6 of the EIS would remove the positive effects on fish habitat and likely result in a decline in sessile or low-mobile invertebrates that were supported by the associated food and habitat subsidies. However, these effects are reversible as natural sediments would remain after removal of infrastructure that would eventually be recolonized from surrounding areas. Therefore, it is predicted that the effects of protection measures would be reversible as the environmental component would return to an equal (i.e., eventual recolonization within footprint of removed protection measures) or improved condition (i.e., artificial reef effects and enhanced productivity with abandonment of protection measures) if left in place after decommissioning. For clarification, the text in Section 9.2.1.1. of the EIS will be amended to read as: "Installation of rock protection and concrete mattresses would have direct, localized physical interaction with the seabed, potentially resulting in mortality and injury of benthic organisms, and change in benthic community. ***The potential effects may be reversible as subsea infrastructure may have localized positive effects with the addition of hard substrate and habitat complexity (See Section 9.2.2.1) or, if removed, sediments remaining after removal of infrastructure would eventually be recolonized from surrounding areas. Therefore, the seabed would return to an equal or improved condition (see Table 4.5)."***	

IR-109 **CEAA-37**	**Guideline Ref:** Part 2, Section 7.5	**EIS Ref:** Section 9.2.1
Context/Rationale	In Section 9.2.1 of the EIS, very little of the information in Sections 5 and 6 was applied to the effects analysis. For example Section 6.1.7 in the EIS acknowledges generic information such as "predator-prey relationships, substrate type and associations with habitat engineering organisms (e.g., corals and sponges)". "Many benthic deep-sea invertebrate species are… regarded as being sensitive to anthropogenic disturbance. In most deep-sea ecosystems, recovery can be very slow." Section 6.1.3 of the EIS "Within depth zones, habitat complexity and the intensity of fishing can further segregate faunal communities. Identified elevated species richness, abundance and biomass of taxa are indicative of Vulnerable Marine Ecosystems (VMEs) within sponge grounds and in areas closed to fishing. Similarly, some species of fish are also known to specifically occupy complex habitats." The description of the benthic effects in Section 9 does not address the ecosystem effects in a holistic manner in the zones of influence or detectable changes above natural variability. The focus is on corals, sponges and seapens and no other benthic organism or the community. This section is based on global research findings, but not applied, if relevant, to the benthic communities in the Flemish Pass in the Core BdN Development Area or the Project Area. The use of site specific information is required to assess relevant environmental effects of the Project. Potential environmental effects from installation of subsea infrastructure and Hook-up and Commissioning (HUC) on the site specific benthic communities identified in Section 6.0 of the EIS were not identified in the ecosystem approach as committed to in Section 4.2 of the EIS. The magnitude rating is defined as the degree of change from baseline conditions in the affected area. The affected area or zones of influence were not described and changes were not provided. Therefore it is not clear how the geographic rating was substantiated. Sections 6.13 and 6.17 of the EIS discuss the high sensitivity, life history characteristics and the low recovery abilities of the benthic community in the Core BdN Development Area. Therefore, the conclusion of short term duration and reversibility of effects does not appear to be substantiated when there is no discussion on direct changes to the physical seafloor habitat, or direct and indirect changes to the benthic community. The FPSO and support vessels are on site during the HUC phase, but not included in the summary of environmental effects. Potential cumulative effects are not considered over that two to three years period with simultaneous activities.	
Request **15-Apr-19**	A. Describe the zone of influence upon the specific benthic community using data from the baseline seafloor surveys. B. Describe natural variability in pelagic and benthic communities and habitats in the Core BdN Development Area and Project Area, based on the baseline survey, area specific fish population data, water quality and sediment quality data. C. Describe the linkages between environmental effects observed in research as cited in the EIS, with the specific marine communities, biotic and abiotic information provided in Sections 5 and 6, and with the zones of influence from Project activities in the Core BdN Development Area and Project Area.	
Equinor Response **15-Nov-19**	A. The spatial boundaries of the Project are described in Section 9.1.1 of the EIS. The Core BdN Area "encompasses the immediate area in which Project activities and components may occur and includes the area within which direct physical disturbance	

	to the marine environment may occur." The Bay Du Nord 2018 Seabed Survey transects included preliminary subsea layout design in the Core BdN Area, which as stated in the EIS may change as design progresses. Refer to IR-126/CEAA-56 regarding updates to the EIS to address additional seabed survey data. The potential area to be affected by Project activities is included in Chapter 9 and are considered in the effects assessment. In addition, response to IR-107/CEAA-36 provides additional information regarding potential area to be affected by subsea infrastructure. The potential effects on fish and invertebrates are detailed in Section 9.2.1, 9.2.2, 9.2.3, 9.2.4, 9.2.5, and 9.2.6, including effects on species groups within the Core BdN Area. B. Descriptions of the physical and biological components of the environment in the Project Areas are presented in Sections 5.0 and 6.1, including information on sediments, oceanographic processes, invertebrate species, and fish species. Section 6.1 also includes biological and spatial information on key fish and invertebrate species, including key reproduction times and area. The approach and level of information presented in the EIS is consistent with similar production projects and is sufficient for assessment the potential effects of the Project. C. The linkage between environmental effects and the physical and biological environments in the Project Area are considered in the effects assessment detailed in Section 9.0. The potential effects on fish and invertebrates are detailed in Section 9.2.1, 9.2.2, 9.2.3, 9.2.4, 9.2.5, and 9.2.6, based on variety of data sources including government and industry reports, and peer-reviewed scientific literature. Project specific modelling of produced water, drill cuttings, and sound used site-specific data (e.g., currents, sediment composition, and bathymetry) to assess the potential effects of the Project on Marine Fish and Fish Habitat as detailed in Section 9.1.4 of the EIS. Therefore, the effects assessment already considers scientific literature on the effects of species groups in combination with Project specific modelling that directly incorporates abiotic site-specific data.

IR-110 **CEAA-39**	Guideline Ref:	**EIS Ref:** Section 9.2.1.3
Context/Rationale	In Section 9.2.1.3 of the EIS, mitigation measures are not identified for installation of subsea infrastructure effects on the benthic ecosystem. The Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands is the only mitigation measure proposed and it is not clear how this fully addresses the discharge of low toxic chemicals and the guidelines that do not limit the volume discharged.	
Request **15-Apr-19**	A. In Section 9.2.1.3 of the EIS discuss what mitigation measures would be applied to address the subsea infrastructure effects on the benthic ecosystem. B. Substantiate the conclusions on residual effects to benthic ecosystems where mitigation measures are not applied.	
Equinor Response **15-Nov-19**	A. See response to IR-101/Conformity DFO-1 regarding the applicability of mitigations to the various project activities. For clarity for the reviewer, mitigations listed in Section 9.2.5.1 which will be implemented, as applicable, to reduce potential impacts to benthic habitat include: avoiding *Lophelia pertusa* corals, using a cuttings transport system, chemical screening, fish habitat compensation, and treating discharges in accordance with regulatory requirements.	

	B. Project activities are described in Section 2.6.1 for offshore construction and installation, hook-up and commissioning. The effects assessment in Section 9.2.1 provides information on potential effects from offshore construction and installation and HUC activities on Marine Fish and Fish Habitat. Residual effects, as summarized in Section 9.2.1.3, consider potential effects (Section 9.2.1.1 and 9.2.1.2) and associated mitigations (Section 9.1.5.2; response to IR-101/Conformity DFO-1).

IR-111	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 9.2.2.1
DFO-160		
Context/Rationale	Section 9.2.2.1 of the EIS needs a reference for the statement "Although egg and larval stages as well as juvenile and adult stages of low-mobility species may be exposed to underwater sound generated by FPSO operations for longer periods, it is improbable that direct physical damage to these biotas would occur".	
Request **15-Apr-19**	Provide reference in Section 9.2.2.1 of the EIS for the quote "although egg and larval stages as well as juvenile and adult stages of low-mobility species may be exposed to underwater sound generated by FPSO operations for longer periods, it is improbable that direct physical damage to these biotas would occur"..	
Equinor Response **15-Nov-19**	A review of the effects on underwater sound on marine fish including eggs, larvae, plankton, fish and invertebrates is presented in Section 9.2.5.1 of the EIS. For clarity, the text in Section 9.2.2.1 of the EIS will be amended to read as: "Although egg and larval stages as well as juvenile and adult stages of low-mobility species may be exposed to underwater sound generated by FPSO operations for longer periods, it is improbable that direct physical damage to these biotas would occur ***(see Section 9.2.5.1).***"	

IR-112	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 9.2.2.1
DFO-81a **CEAA-41**		
Context/Rationale	Section 9.2.2.1 of the EIS provides a good overview of the benefits of increasing habitat complexity through the addition of hard substrate. However, there is no mention of the changes in species composition due to a change in available substrate. For example, there is a lot of soft mud substrate within the Core BdN Development Area (Flemish Pass). A shift to hard complex substrates would likely alter the benthic community composition. Based on the benthic and pelagic community information in Section 6.0 of the EIS, surface area of the subsea infrastructures, and potential protection measures, an estimated increase in habitat complexity can be assessed. The subsea structures are noted as potentially providing food subsidies without explanation of the process or applicability to deep water conditions in the Project Areas and the organisms that live there. It is difficult to conclude that an effect is positive or negative without fully understanding the cascade effect of attraction of a species to structure/vessel lights without a thorough understanding of the implications of such on the food web. Such information is not described in this instance. An effects analysis rating is not provided for the potential effects from the project's physical structures. This information is needed to fully assess the environmental effects of the Project.	

<table>
<tr><td>Request
15-Apr-19</td><td>A. Describe changes in species composition that may occur due to a change in available substrate.

B. Describe the concept of food subsidies and how that relates to changes in the environment.</td></tr>
<tr><td>Equinor Response
15-Nov-19</td><td>A. The potential effects of the presence of FPSO and subsea infrastructure is described in Section 9.2.2.1.

For clarity, the text in Section 9.2.2.1 will be amended to read as:

“Artificial structures introduced to environments can have local influences on invertebrate community structure, species diversity, and abundance through the addition of hard substrate and habitat complexity (Wolfson et al. 1979; Bomkamp et al. 2004; Apolinario and Coutinho 2009; Macreadie et al. 2011; Ajemian et al. 2015, Reynolds et al. 2018; Lacey and Haynes 2019). Initial installation of the subsea infrastructure may result in direct injury and mortality of fish and invertebrates (placement loss) within the footprint of the subsea infrastructure and short-term turbidity effects of natural sediments (Heery et al. 2017). Over time on the subsea infrastructure, there may be a shift from a soft bottom benthic invertebrate community, to communities associated with hard substrate. Anti-collision zones that are established around the FPSO and drilling installations, which would be avoided by marine traffic, may provide a temporary refuge for fish (Franks 2000; Keenan et al. 2007; Macreadie et al. 2011; Cordes et al. 2016) and reduce effects on trawling disturbance on benthic communities (Heery et al. 2017). In these instances, fish and invertebrate species may benefit through increased availability of shelter and food for juveniles, and by the decreased fishing pressure on adults…The presence of subsea infrastructure (i.e., anchors, well templates, risers) and potential protection measures (e.g., rock placement, wellhead protection, concrete mattresses) may locally increase habitat complexity through introduction of available hard structures for colonization by sessile species (Sargent et al. 2006; Bergström et al. 2014; Cordes et al. 2016; Lacey and Haynes 2019). This may also provide localized organic enrichment or food subsides with natural dislodgement of settled sessile invertebrates and faecal pellets (Lacey and Haynes 2019) and material fluxes adjacent to the structures associated with dislodged shells and changes in local hydrodynamics (Heery et al. 2017). Studies have indicated that enrichment for oil and gas platforms is limited to within 100 m of the structure and within 500 m for material fluxes (Heery et al. 2017). The types of subsea infrastructure may have similar abundances and biomasses of colonized benthic organisms, however concrete structures have been shown to host more diverse benthic communities in comparison to structures comprised of steel (Bergström et al. 2014). The changes to benthic communities would be dependent on a variety of factors including local biotic communities, depths, oceanographic processes, structure design and configuration, material composition.”

B. Food subsidies associated with increased presence of infrastructure is discussed in Section 9.2.2.1, which states “These structures may also attract invertebrate and fish species and provide food subsidies through fouling and colonization of infrastructure that may support higher trophic levels (Wolfson et al. 1979; Bomkamp et al. 2004; van der Stap 2016; Fujii 2016).” The removal of infrastructure and associated food subsidies is described in Section 9.2.6.2, which states ” Removal of the infrastructure will likely result in a localized decline in sessile or low-mobile invertebrates that were</td></tr>
</table>

	supported by the associated food and habitat subsidies, but mobile opportunistic species would be supported for a short time." Updates to the EIS are not required. References: Ajemian, M.J., J.J. Wetz, B. Shipley-Lozano, J.D. Shively, and G.W. Stunz. 2015. An analysis of artificial reef fish community structure along the northwestern Gulf of Mexico shelf: potential impacts of "Rigs-to-Reefs" programs. PLoS One, 10(5), e0126354. Apolinario, M., and R. Coutinho. 2009. Understanding the biofouling of offshore and deep-sea structures. In: C. Hellio and D. Yebra (eds.), Advances in marine antifouling coatings and technologies. Woodhead Publishing, Sawston, UK, 132-147. Bergström, L., L. Kautsky, T. Malm, R. Rosenberg, M. Wahlberg, N.Å. Capetillo, and D. Wilhelmsson. 2014. Effects of offshore wind farms on marine wildlife—a generalized impact assessment. Environmental Research Letters, 9(3), 034012. Bomkamp, R.E., H.M. Page, and J.E. Dugan. 2004. Role of food subsidies and habitat structure in influencing benthic communities of shell mounds at sites of existing and former offshore oil platforms. Marine Biology, 146(1): 201-211. Claisse, J. T., Pondella, D. J., Love, M., Zahn, L.A., Williams, C.M., Williams, J.P., and A.S. Bull. 2014. Oil platforms off California are among the most productive marine fish habitats globally. Proceedings of the National Academy of Sciences, 111(43), 15462-15467. Claisse, J.T., D.J. Pondella II, M. Love, L.A. Zahn, C.M. Williams, and A.S. Bull. 2015. Impacts from partial removal of decommissioned oil and gas platforms on fish biomass and production on the remaining platform structure and surrounding shell mounds. Public Library of Science one, 10(9), e0135812. Cordes, E.E., D.O.B. Jones, T.A. Schlacher, D.J. Amon, A.F. Bernardino, S. Brooke, R. Carney, D.M. DeLeo, K.M. Dunlop, E.G. Escobar-Briones, A.R. Gates, L. Génio, J. Gobin, L. Henry, S. Herrera, S. Hoyt, M. Joye, S. Kark, N.C. Mestre, A. Metaxas, S. Pfeifer, A.K. Sweetman, and U. Witte. 2016. Environmental impacts of the deep-water oil and gas industry: A review to guide management strategies. Frontiers in Environmental Science, 4: 1-26. Franks, J. 2000. A review: pelagic fishes at petroleum platforms in the Northern Gulf of Mexico; diversity, interrelationships, and perspective. In: Pêche thonière et dispositifs de concentration de poissons, Caribbean-Martinique, 15-19 Oct 1999. Fujii, T. 2016. Potential influence of offshore oil and gas platforms on the feeding ecology of fish assemblages in the North Sea. Marine Ecology Progress Series. Keenan, S.F., M.C. Benfield, and J.K. Blackburn. 2007. Importance of the artificial light field around offshore petroleum platforms for the associated fish community. Marine Ecology Progress Series, 331: 219-231. ***Lacey, N. C., and Hayes, P. 2019. Epifauna associated with subsea pipelines in the North Sea. ICES Journal of Marine Science.*** Macreadie, P.I., A.M. Fowler, and D.J. Booth. 2011. Rigs-to-reefs: will the deep sea benefit from artificial habitat? Frontiers in Ecology and the Environment, 9(8): 455-461. Reynolds, E.M., Cowan Jr, J.H., Lewis, K.A., and K.A. Simonsen. 201). Method for estimating relative abundance and species composition around oil and gas platforms in the northern Gulf of Mexico, USA. Fisheries research, 201, 44-55.

	Sargent, P.S., R.S. Gregory, and D.C. Schneider. 2006. Density responses of subarctic coastal marine fish and crabs to artificial reefs. Transactions of the American Fisheries Society, 135(2): 348-360. van der Stap, T., J.W. Coolen, and H.J. Lindeboom. 2016. Marine fouling assemblages on offshore gas platforms in the southern North Sea: Effects of depth and distance from shore on biodiversity. PloS one, 11(1): e0146324. Wolfson, A., G. van Blaricom, N. Davis, and G.S. Lewbel. 1979. The marine life of an offshore oil platform. Marine Ecology Progress Series: 81-89.

IR-113 **DFO-81b** **CEAA-41**	Guideline Ref: Section 7.3.1	**EIS Ref:** Section 9.2.2.1
Context/Rationale	In Section 9.2.2.1 of the EIS it states that the control of invasive species will be through the adherence to Canadian and international ballast water management practices. It appears that only ballast water is considered as a vector for aquatic invasive species. Hull biofouling communities may also introduce invasive species and this vector should also be assessed since the drill ships and other platforms often work around the world. Other control measures, such as hull inspections, have not been considered in managing the introduction of biofouling invasive species attached to project vessels, the FPSO, and MODUs. The sloughing of biofouling mats from the hull of the FPSO and mooring system would introduce food sources to the benthos and the change in fish community as a result was not discussed. This information is needed to fully understand all potential sources of changes to the environment to support assessment of the Project effects.	
Request **15-Apr-19**	A. Justify why adherence to the Canadian and international ballast water management practices is sufficient to ensure no significant adverse effects from invasive species. B. Provide an assessment of the introduction of invasive species via hull fouling.	
Equinor Response **15-Nov-19**	A. The effectiveness of federal Ballast Water Control and Management Regulations, which were introduced in 2006, in controlling the introduction/spread of invasive species has been recognized by Transport Canada (2015). For all marine vessels ballast water and the control of invasive species is managed by Transport Canada and internationally by the IMO. While the EIS Guidelines do not require Equinor Canada to address the issue of invasive species, Equinor Canada is aware that invasive species, which can threaten marine ecosystems, occupy habitats or compete with native species, introduce new diseases and alter ecosystem processes, may be transmitted through ballast water or on the hull of vessels. Although the likelihood that a Project vessel will result in the introduction and spread of an invasive species is relatively low, as indicated in the EIS ballast water will be managed using best practices and in compliance with applicable Canadian and international ballast water management requirements to reduce the potential spread of invasive species, as is required for the over 40,000 Canadian flagged vessels transiting in Canadian waters in 2018, and the over 25,000 foreign flagged vessels transiting in Canadian waters in 2018 (Transport Canada 2018). Ballast water management is addressed in Chapter 2 and potential effects on fish and fish habitat are assessed in Chapter 9, with clarification provided in Part B to this IR, below.	

	B. Section 9.2.2.1 of the EIS discusses potential effects of invasive species from the presence of the FPSO and subsea infrastructure and are applicable to supply vessels. For clarity, Section 9.2.2 will be amended to read as: "In offshore environments, species may be transmitted to the platform through ballast water or on the hull of vessels servicing the offshore area (Sammarco et al. 2004) or through local recruitment. ***The majority of published literature has focused on ballast water as an invasion vector, though hull fouling is acknowledged as a lesser vector for species. While ballast water typically contains mobile, pelagic forms of species that can colonize quickly, hull biofouling typically is made up of adult individuals which have a lower invasion potential (Drake and Lodge 2007). Additionally, fouling assemblages show a decrease in diversity with increasing distance from shore (van der Stap et al. 2016). Organisms attaching to hard substrate are typically seen in nearshore and benthic environments, and their effects are likely more important to coastal communities compared to the open ocean (Templeman 2010 in Amec 2014). The distance to shore will likely inhibit or slow the colonization by organisms adapted to rocky surfaces and inhabit any stepping-stone invasions in the same way.*** Prevention is considered to be key in controlling the introduction and spread of aquatic invasive species, because control of established populations is often costly and ecologically risky (Bax et al. 2001). ~~Although~~ The likelihood that a Project vessel will result in the introduction and spread of an invasive species is relatively low. Ballast water ***and hull fouling*** will be managed in consideration of applicable Canadian and international ~~ballast water management~~ requirements to reduce the potential spread of invasive species. ***In addition, anti-fouling paint will be used on the hull of the FPSO***." References: ***Drake, J.M. and Lodge, D.M. 2007. Hull fouling is a risk factor for intercontinental species exchange in aquatic ecosystems. Aquatic Invasions. 2(2):121-131.*** Transport Canada. 2015. Ballast water and the Great Lakes-St. Lawrence Seaway System. Transport Canada. 2018. Transportation in Canda 2018 Overview Report. https://www.tc.gc.ca/documents/Transportation_in_Canada_2018.pdf. Templeman, N.D. 2010. Ecosystem Status and Trends Report for the Newfoundland and Labrador Shelf. Canadian Science Advisory Secretariat Research Document 2010/026. 78 p. van der Stap T, Coolen J.W.P., and Lindeboom H.J. 2016. Marine Fouling Assemblages on Offshore Gas Platforms in the Southern North Sea: Effects of Depth and Distance from Shore on Biodiversity. PLoS ONE 11(1): e0146324. https://doi.org/10.1371/journal.pone.0146324

IR-114	**Guideline Ref:** Section 7.3.1	**EIS Ref:** Section 9.2.2.1
DFO-82		
Context/Rationale	In Section 9.2.2.1 of the EIS there are discrepancies between the EIS and references as follows:	

	"For example, swordfish and other pelagic fishes have been shown to be attracted to marine, (structures?) including oil platforms, fish farms, and offshore wind turbines (Franks 2000; Fayram and de Risi 2007; Arechavala-Lopez et al. 2013)." Arechavala-Lopez et. al. (2013) describes one incident of one swordfish observed beneath a fish farm located in the Western Mediterranean. This does not support the statement attached to it. "Other fishes, such as cod, pollock, and mackerel have also been observed in higher numbers around offshore platforms in the North Sea (Valdermarsen 1979; Soldal et al. 2002)". Soldal et. al. (2002) examined only decommissioned platforms in the North Sea, not active oil and gas installations. The Valdermarsen (1979) reference conducted investigations in the Adriatic Sea <u>not</u> the North Sea. These references do not support the statement. "However, there is no direct evidence of mortality to fishes and invertebrates as a result of exposure to continuous underwater sound from these types of activities (Popper and Hastings 2009; Popper et al. 2014)." This is a direct quote from Popper and Hastings (2009) "Findings suggest that human-generated sounds, even from very high intensity sources, might have no effect in some cases or might result in effects that range from small and temporary shifts in behavior all the way to immediate death." This does not support the statement in the text. It appears that a lot of the material has been directly taken from other EIS documents from the Gulf of Mexico and the Adriatic Sea. There should be more applicable references available from the North Sea, Norway, or even from monitoring studies conducted in Newfoundland and Labrador for the offshore oil and gas industry. This information is needed to substantiate the effects analysis of the Project.
Request 15-Apr-19	A. All references within Section 9.2.2.1 should be verified to ensure their content supports the conclusions presented in the text. B. Incorporate applicable references from the North Sea, Norway, or monitoring studies conducted in offshore Newfoundland and Labrador and update effects assessment, as necessary. Identify data and knowledge gaps.
Equinor Response 15-Nov-19	Available information on the effects of the presence of FPSO and subsea infrastructure have been incorporated into the EIS to provide information on potential effects on Marine Fish and Fish Habitat. This includes providing information from other regions that have studied these particular aspects of the effects of marine structures on fish aggregations. While there is limited information on fish species nearby Newfoundland and Labrador offshore production facilities, the environmental effects monitoring studies for existing production facilities are not designed to assess the effects of the platforms on fish aggregation. • Section 9.2.2.1 of the EIS describes potential effects of the Presence of FPSO and Subsea infrastructure. The text cites Franks (2000); Fayram and de Risi (2007); Arechavala-Lopez et al. (2013). Franks (2000) is a review of pelagic fishes at petroleum platforms in the Northern Gulf of Mexico, and its findings support the statement of attraction to marine structures. Fayram and de Risi (2007) observed bluefin tuna near potential wind farm sites in the Adriatic Sea and comes to similar conclusions regarding their attraction to marine structures. As stated by reviewers, Arechavala-Lopez et al. (2013) observed a swordfish near fish farms, but also provides further examples of other pelagic fish species attracted to marine structures. For

	clarification, the text in Section 9.2.2.1 of the EIS will be amended to read as: "For example, swordfish and other pelagic fishes have been shown to be attracted to marine ***structures***, including oil platforms, fish farms, and offshore wind turbines (Franks 2000; Fayram and de Risi 2007; Arechavala-Lopez et al. 2013)." • Soldal et al. (2002) and Valdemarsen (1979) are appropriate references for the statement highlighted. The section describes the potential effects of lighting on Marine Fish and Fish Habitat. Soldal et al. (2002) describes the effects of a partially decommissioned platform in the North Sea where there are no waste discharges or sound emissions, however, the platform remains illuminated at night. In addition, the Valdemarsen (1979) study takes place in the Ekofisk oil field in the North Sea, not the Adriatic. The title of the report as noted in the References (Section 9.7 of the EIS) is "Behavioural aspects of fish in relation to oil platforms in the North Sea". Updates to the EIS are not required. • Popper and Hastings (2009) and Popper et al. (2014) are appropriate references for the statement highlighted. These papers indicate that there are potential adverse effects of continuous sounds (e.g., vessel sound) on fishes in experimental studies, however, as stated, there are no studies associating continuous underwater sound with fish mortality. In relation to continuous sounds, Popper and Hastings (2009) states "Although it is not likely that such sounds will kill per se, there are concerns that such sounds will result in masking of biologically important sounds, cause some hearing loss, and/or have an impact on stress levels and on the immune system." As stated in Popper et al. (2014) "There is no direct evidence of mortality or potential mortal injury to fish or sea turtles from ship noise." The effects of sound on Marine Fish and Fish Habitat are fully discussed in Section 9.2.5.1. Updates to the EIS are not required. EIS conclusions are evidence based, using all available information as described in Section 4.3.3. Uncertainties associated with predictions are noted in the EIS. References: Arechavala-Lopez, P., D. Izquierdo-Gomez, and P. Sanchez-Jerez. 2013. First report of a swordfish (Xiphias gladius Linnaeus, 1758) beneath open-sea farming cages in the Western Mediterranean Sea. Mediterranean Marine Science, 15(1): 72-73. Fayram, A.H., and A. de Risi. 2007. The potential compatibility of offshore wind power and fisheries: an example using bluefin tuna in the Adriatic Sea. Ocean & Coastal Management, 50(8): 597-605. Franks, J. 2000. A review: pelagic fishes at petroleum platforms in the Northern Gulf of Mexico; diversity, interrelationships, and perspective. In: Pêche thonière et dispositifs de concentration de poissons, Caribbean-Martinique, 15-19 Oct 1999. Popper, A.N., and M.C. Hastings. 2009. The effects of human-generated sound on fish. Integrative Zoology, 4: 43-52. Popper, A.N., A.D. Hawkins, R.R. Fay, D. Mann, S. Bartol, T. Carlson, S. Coombs, W.T. Ellison, R. Gentry, M.B. Halvorsen, S. Løkkeberg, P. Rogers, B.L. Southall, D. Zeddies, and W.N. Tavolga. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI, ASA S3/SC1.4 TR-2014. Springer and ASA Press, Cham, Switzerland.

	Soldal, A.V., I. Svellingen, T. Jørgensen, and S. Løkkeborg. 2002. Rigs-to-reefs in the North Sea: hydroacoustic quantification of fish in the vicinity of a "semi-cold" platform. ICES Journal of Marine Science, 59: S281–S287. Valdemarsen, J.W. 1979. Behavioural aspects of fish in relation to oil platforms in the North Sea. ICES CM 1979/B: 27.

IR-115 **CEAA-42**	Guideline Ref:	**EIS Ref:** Section 9.2.2.1; Section 9.2.3.2
Context/Rationale	In Section 9.2.2.1 of the EIS the discussion on lighting effects on the marine ecosystem, presumably in the epipelagic environment, is considered to influence food webs, nutrient availability, finfish distribution, and zooplankton distribution. Large pelagics were described in Section 6.0 of the EIS as not occurring in the Core BdN Development Area based on commercial fish catches, yet are included as potentially being affected by project lights. This statement implies the zone of influence of FPSO lights is very large, about 100 km in distance and has considerable water depth penetration. It is unclear why groundfish species are not considered. An effects analysis rating is not provided for the potential cumulative effects of the Project's multiple light sources. In Section 9.2.3.2 of the EIS, the zones of influence from lights and underwater sound from one or two MODUS and their support vessels have not been identified in a three-dimensional manner to rate the effects as being the same for an FPSO. The natural variability in light was not provided for comparison to enable a discussion of measurable changes in habitat (e.g. underwater light levels). As the zone of influence of lighting from one and two MODUs is not provided, the measureable change to fish habitat from light was not discussed. There was no mitigation measure applied to lights. Therefore, the effects rating is not substantiated by evidence and the data or knowledge gaps were not identified.	
Request **15-Apr-19**	A. Provide the zone of influence of underwater lighting (horizontal and vertical) from the project sources to substantiate the conclusions of effects. B. Identify data and knowledge gaps, where necessary. C. Provide the effects analysis of the change in light levels on fish habitat (water column and food) and fish in an ecosystem context (species affected, changes in food sources, changes in vertical migration patterns, changes in food webs, changes in species presence, change in predator – prey interactions, etc.). Include a consideration of temporal boundaries.	
Equinor Response **15-Nov-19**	See response to IR-26/CEAA-12	

IR-116 **DFO-126**	**Guideline Ref:** Part 2, Section 7.3.1; Section 7.3.4	**EIS Ref:** Appendix D
Context/Rationale	In Appendix D of the EIS, there is very limited information available to assess the impacts of seismic, or noise in general, on marine life other than marine mammals, and therefore the report should acknowledge this absence of information (if it exists) as an important information gap.	

Request 15-Apr-19	In Appendix D and Section 9.0 of the EIS, describe implications of limited information on impacts of noise on marine life other than marine mammals.
Equinor Response 15-Nov-19	Equinor Canada disagrees with the reviewer's opinion that the EIS does not adequately address impacts of sound on marine life. The potential effects of Project-associated sound on Fish and Fish Habitat are addressed in Sections 9.2.2.1, 9.2.3.1 and 9.2.5.1 of the EIS. The information presented in Sections 9.2.2.1 and 9.2.5.1 of the EIS provides an overview summary of readily available scientific information of the effects of sound on fish and fish habitat. Appendix D is a report on the results of sound modelling for the BdN Development project. Potential impacts associated with sound on marine life are addressed in the applicable VC chapters.

IR-117 **CEAA-43**	**Guideline Ref:** Part 2, Section 7.3.1, Section 7.3.4	**EIS Ref:** Section 9.2.2.1
Context/Rationale	In Section 9.2.2.1 and Appendix D of the EIS there is no information on distances between the FPSO and its supply vessels, the MODUs and its supply and support vessels, and seismic vessels. There is no discussion regarding the potential for cumulative effects from sound from simultaneous operations of the vessels. It appears that sound modeling is based on thrusters from the FPSO, and a drillship (individual emissions and combined). However, the model location is for the same geographic location which is not technically possible as both vessels cannot occupy the same location.	
Request 15-Apr-19	A. Provide mapping of the zone of influence of sound attenuation/propagation over the Core BdN Development Area and future project area between support vessels for the moored FPSO, a seismic vessel, and MODUs and their support vessels at the drill template locations to capture cumulative sound and vibration effects. B. Based on the zones of influence provide an effects analysis to substantiate the conclusions of sound effects from "all project vessels" as stated in the EIS, and sound for "all project vessels" sources on the fish species communities and assemblages (epipelagic, mesopelagic, benthic and diel vertical migrators) found in the Core BdN Development Area and Project Area as described in Section 6.0.	
Equinor Response 15-Nov-19	A. See responses to IR-11/CEAA-5 Part B and IR-119/CEAA-44 regarding the cumulative zones of influence for sound. B. The effects assessment presented in Chapter 9 considers the intra-project effects of multiple activities. See Equinor Canada response to IR-219/Conformity DFO-4	

IR-118 **CEAA-43**	**Guideline Ref:** Part 2, Section 7.3.1, Section 7.1.2	**EIS Ref:** Section 9.1.5.2
Context/Rationale	Reference is made to effects on swim bladdered fish species only. Fish species found in the Core BdN Development Area provided in Section 6 of the EIS include species without swim bladders and swim bladders not used for sound detection. The fish species potentially affected should be identified and their ecological, social and or economic value to the Project Area ecosystem described.	
Request 15-Apr-19	A. Identify the specific fish species and or fish assemblages that could be affected by project sound emissions.	

	B. Describe how the ecological, social and or economic value of affected fish with swim bladders may or may not be compromised.
Equinor Response 15-Nov-19	A. The degree of effect of exposure to underwater sound depends on a number of factors including the following: • Sensitivity of fish to sound pressure and/or particle motion; • Levels of sound pressure and/or particle motion received by fishes; and • Motivational state of fish receiving the sound. In Section 9.2.2.1 - Sound of the EIS, emphasis was placed on fish that use swim bladders in sound detection (e.g., Atlantic cod, redfish, capelin, swordfish) because continuous sound being emitted by the FPSO could potentially cause behavioural effects on those particular species in the Core BdN Development Area. Fishes that either do not have a swim bladder or have a swim bladder that is not involved in sound detection that occur in the BdN Development Area (e.g., wolffish, flatfish, shark, skate, lanternfish) are able to detect particle motion only. Note that fishes with swim bladders that are not involved in sound detection are still potentially susceptible to injury due to exposure to sound pressure but sound pressure levels typically emitted by an FPSO are unlikely to result in injury to these fishes. As indicated in Section 9.2 of the EIS the potential residual effects of exposure to Project-related underwater sound on fishes are predicted to be minimal and temporary. Therefore, the ecological, social and/or economic value of any fish that exhibits behavioural responses to Project-related sound will not be compromised. B. For clarity, Section 9.5.1 of the EIS will be amended to include the following text: "Environmental and geotechnical surveys are predicted to have similar transient and sporadic environmental effects with limited interactions with the seabed. ***Therefore, the ecological, social and/or economic value of any fish that exhibits behavioural responses to Project-related sound will not be compromised."***

IR-119 **CEAA-44**	Guideline Ref:	**EIS Ref:** Section 9.2.2.1
Context/Rationale	Section 9.2.2.1 of the EIS comments on fish attraction to Dynamic Positioning (DP) vessels (in Norway), but the statement is not clear if this is due to sound or other factors. The effects consideration of lighting concludes there will be attraction to vessels from lights, but an avoidance behaviour response, and perhaps injury, from sound / vibration. Without zones of influence provided in both the horizontal and vertical planes for lights and sound / vibration, it is not clear how the associated conclusions are made. The limit on exposure for hearing injury is 12 to 48 hours, yet the shuttle tanker, FPSO, MODU and vessels will generate sound and vibrations longer than 12 to 48 hours. If fish are attracted by light and food waste then they may well be exposed to hearing injury levels. The horizontal distance for the FPSO site and drillship predicted for fitness related behavioural changes in swim bladdered fish species is 125 m. Therefore a portion of the safety zone considered to provide refuge for fish is potentially not suitable due to sound emissions from vessels.	

	The effects assessment does not evaluate detectable change in fish habitat availability and quality, change in food availability and quality, and change in fish presence or absence. Consideration of two MODUs and support vessels and the potential for cumulative sound effects and the ensonified area was not provided. With lights attracting fish and sound deterring fish, there is no discussion on the cumulative effects for the Project activities. There is no mitigation measure applied to sound effects.
Request 15-Apr-19	A. Provide the cumulative zones of influence for sound/vibration from the FPSO, tanker, MODU and vessels and overlay the zone of influence from lighting and organic waste discharge to substantiate the overall effects analysis conclusion. B. Provide a cumulative effects analysis on the vertical and horizontal zone of influence of vibration, sound, lights and food related waste discharges for all project vessel sources on the fish species communities and assemblages found in the Project Area as described in Section 6.0.
Equinor Response 15-Nov-19	A. See response to IR-11/CEAA-5 Part B regarding the cumulative zones of influence for sound. Additional information is provided in the following paragraphs. Regarding the SPL associated with the vessel/MODU sound, based on JASCO modelling the 160 dB re 1 µPa (0-p) threshold for behavioural effects on finfishes that use swim bladders in hearing, is encountered within 40 m of the source. The EIS Section 9.2.5.1 provides the rationale for use of the 160 dB re 1 µPa (0-p) threshold. The rationale in reviewer's comment above states "the limit on exposure for hearing injury is 12-48 hours, yet the shuttle tanker, FPSO, MODU and vessels will generate sound and vibrations longer than 12 to 48 hours". In Table 7.7 of Popper et al. (2014), the only quantitative guidelines associated with continuous sound are for fishes with swim bladders used in hearing. The table provides the following guidelines: 170 dB rms for 48 hrs could cause 'recoverable injury', and 158 dB rms for 12 hrs could cause' temporary threshold shift'. These numbers were derived from laboratory experiments on captive goldfish by Smith et al. (2006) and on goldfish and catfish by Amoser and Ladich (2003). The continuous sound used in these experiments was 'white noise' produced by noise generators. It is unlikely that fishes in the open marine environment with unrestricted movement, attracted by light and food waste would be exposed to injurious sound levels. For the BdN EIS, sound modelling was carried out for a drilling unit, FSPO and a combination of both generated Rmax and R95% values for received rms sound pressure levels ranging from 120 to 160 dB rms. These received SPLs were selected based on typical source sound pressure levels of the drillship and FPSO. As for the 158 dB rms threshold guideline, even if TTS did occur, it is temporary in nature. However, it is unlikely that fishes in an open environment would remain within 40 m of the sound source for 12 hours. Each LSA (ZOI) is defined in the respective VC chapter. An overlay of the all the ZOIs is provided in the EIS in Figure 4-1. Therefore, the information in the EIS is complete and amendments are not required. With regards to the ZOI for lighting, as stated Section 10.1.1 of the EIS, a 16 km horizontal ZOI from the Project area was used in the effects assessment. This conservatively provides a potential zone of influence for intra-and inter-Project effects on which the intra-project effects and cumulative effects were based. Updates to the EIS are not required.

<table>
<tr><td></td><td>The ZOI for waste discharges were provided based on modeling of the waste discharged deemed to potentially to have the greatest environmental effect, per Section 3.2 of the Guidelines (see response to IR-13/CEAA-6;DFO-1 Part h). Using the results of the modelling, the ZOI for produced water would be confined to the location of the FPSO. For drill cuttings, the ZOI defined by the modelling would apply to each drill template location. These ZOIs were applied to the inter- and intra-Project effects assessment, including cumulative effects. Updates to the EIS are not required.

B. The effects on the vertical and horizontal ZOI of vibration and light on fish and fish habitat were not directly assessed as they were not identified as requirements per the EIS Guidelines. Furthermore, there are no regulatory guidelines related to the effects of vibration and light on fish and fish habitat. The degrees of attraction to and avoidance of offshore installation likely vary between species and within species (e.g., life stage). Oceanographic conditions and ongoing operational activities likely affect the degrees of attraction to and avoidance of platforms due to light and sound being emitted. The effects assessment of sound and light on marine fish is described in Sections 9.2.5.1 and 9.2.2.1, respectively.

The approach used in the EIS is reflective of direct and indirect interactions and is standard practice in assessments in offshore areas, including the recently approved Flemish Pass Drilling EA. Therefore, the information in the EIS is complete and amendments are not required.</td></tr>
</table>

<table>
<tr><td>IR-120</td><td rowspan="2">Guideline Ref:</td><td rowspan="2">EIS Ref: Section 9.2.2.2</td></tr>
<tr><td>CEAA-45</td></tr>
<tr><td>Context/Rationale</td><td colspan="2">Section 9.2.2.2 of the EIS refers to multiple Newfoundland-Labrador offshore area production projects to describe the predicted effects of produced water (EMCP 2017), however it appears that this only includes the Hebron Project, a production facility recently brought online in 2018.

Results from the more mature fields of Hibernia, Terra Nova and White Rose, with longer monitoring programs, would provide more information regarding the zone of influence of produced water on seawater quality.</td></tr>
<tr><td>Request
15-Apr-19</td><td colspan="2">Evaluate the effect monitoring study findings on produced water from all four Grand Banks production fields in shallow water (80 - 100 m) and predicted results in the deep water proposed project site (1100 m) or provide a rationale to indicate why using just the Hebron Project information is sufficient.</td></tr>
<tr><td>Equinor Response
15-Nov-19</td><td colspan="2">As detailed in Section 9.2.2.2, the EIS considers a variety of information sources to inform the effects assessment of produced water on fish and fish habitat, including the EEM programs for the existing production operations (e.g., Hibernia, Terra Nova and White Rose), scientific literature (e.g., Neff et al. 2011, Deblois et al. 2014) and site-specific modelling (Appendix J of the EIS).

As part of the design for the Hebron Project environmental effects monitoring (EEM) program, the results of the previous ongoing EEM programs for the Hibernia, Terra Nova and White Rose Programs were considered. This included a review of water quality parameters for each of the EEM programs and evidence for project-induced changes from produced water. Produced water is generally rapidly dispersed and diluted (Neff et al. 2011) and the EEMs for existing production operations (e.g., Hibernia, Terra Nova and White Rose) confirm that the extent is spatially limited (EMCP 2017).</td></tr>
</table>

	The text in EIS in Section 9.2.2.2 will be amended to read as: "Environmental effects monitoring (EEM) programs at the existing production operations ***(e.g., Terra Nova, White Rose, Hibernia***) in the Canada-NL Offshore Area have not detected changes in the water column related to produced water beyond 50 m from the discharge point (EMCP 2017)."

IR-121 **CEAA-51**	Guideline Ref:	**EIS Ref:** Section 9.2.2.2
Context/Rationale	In Section 9.2.2.2 of the EIS, the discharge of hydraulic fluids and blowout preventer fluids may have effects on fish and fish habitat, but those effects are not identified. The fish potentially affected are not identified. The habitat potentially affected is also not identified.	
Request **15-Apr-19**	A. Provide an effects analysis considering potential effects on fish and fish habitat from hydraulic fluids and blow out preventer fluids. B. Provide effects rating conclusions with supporting reasons.	
Equinor Response **15-Nov-19**	As stated in response to IR-13/CEAA-6; DFO-1 (Part H), the effects assessment of project activities was based on those discharges/activities "with the greatest potential to have environmental effects" (per Section 3.2 of the EIS Guidelines). As indicated in the EIS, the volumes of hydraulic fluid and BOP fluids are much lower in comparison to larger volumes wastes such as produced water. The Offshore Waste Treatment Guidelines (OWTG) (NEB et al 2010) does not set performance targets for hydraulic or BOP fluids, rather, in accordance with the OTWG, these discharges must be described in the operator's EPP including an estimate of volume that could be discharged. Furthermore, as described in Section 2.7.5, all chemicals that may be discharged will be screened in accordance with C-NLOPB guidance, with the goal of choosing chemicals that once discharged a sea would have the least effect on the environment. This is consistent with the guidance offered in the OWTG respecting the subsea fluids "The toxicity of these fluids is managed through the chemical management system developed by the operator in consideration of the *Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands,* and, as far as possible, the operator is expected to select the lowest toxicity alternative and minimize the amount discharged" (NEB et al. 2010). Therefore, detailed environmental assessment of hydraulic fluids and BOP fluids was not considered specifically in the effects assessment. Updates to the EIS are not required. References: NEB, CNSOPB, and C-NLOPB. 2009. Offshore Chemical Selection for Drilling and Production Activities on Frontier Lands. Issued April 2009. Available online at: https://www.neb-one.gc.ca/bts/ctrg/gnthr/2009ffshrchmclgd/2009ffshrchmclgd-eng.pdf. NEB, CNSOPB, and C-NLOPB. 2010. Offshore Waste Treatment Guidelines. Issued 15 December 2010. Available online at: https://www.neb-one.gc.ca/bts/ctrg/gnthr/2010ffshrwstgd/2010ffshrwstgd-eng.pdf.	

IR-122 **DFO-83**	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 9.2.3.2
Context/Rationale	The information in Section 9.2.3.2 of the EIS is considered an update of the Flemish Pass Exploration Drilling EIS (Statoil 2017). The Statoil (2017) EIS included up to 30	

	exploratory wells in the Flemish Pass and the effects of drilling wastes was assessed for a single well with the assumption that there would be no overlap in the zone of impact for the 30 wells. According to Figure 2.3 in Section 2.0 Project Description, eight wells have been drilled in the Core Bay du Nord (CBdN) already and another seven wells in the Project Area (PA). This would mean that even with no further exploratory drilling there might be up to 48 wells in the CBdN and up to 75 in the PA. It is not known how realistic the assumption of no overlap is, given the small size of the CBdN or the larger PA.
Request 15-Apr-19	Justify the assumption that there would be no overlap in the zone of impact from drilling 30 exploration wells with development drilling in the same project areas for the Bay du Nord EIS.
Equinor Response 15-Nov-19	The EIS and associated drill cuttings modelling is based on preliminary design estimates of up to 40 wells for the Core BdN Development, drilled in five templates. Based on preliminary design, the templates may range in size to allow for the drilling of up to 4, 6 or 8 wells per template (see section 2.5.3.2). As the templates are fixed in location, the discharge of drill cuttings would be confined to the area of the template. The drill cuttings modelling for the BdN Project included an eight-well scenario that resulted in cuttings deposition above the predicted no effects threshold (PNET) to be limited within 200 m of the well site. As there is a minimum of 1 km separation between template locations, overlapping drill cuttings deposition areas from production drilling are will likely not occur. As stated in Section 9.2.3.2 of the EIS "Using the potential subsea layout (Section 2.5.3.2), should an 8-slot well template be drilled anywhere within the Core BdN Development Area, cuttings deposition would likely remain within the boundaries of the Project Area and there is little or no potential for these environmental releases from individual wells or multiple wells to interact or accumulate beyond the Project Area." Exploration drilling could occur on EL 1156, EL 1154, EL 1143, which overlap with the Project Area. Equinor Canada disagrees with the reviewer's assumption; however, that there would be overlap with 30 exploration wells. Once production commences, exploration wells would not be drilled within the development area, which would then be defined by a Production Licence issued by the C-NLOPB. Therefore, there will be no overlap of drill cuttings discharges from future exploration drilling and development drilling within the Core BdN development area. The drilling of up to 30 exploration wells, across six exploration licenses held by Equinor Canada is assessed in the Flemish Pass Drilling EIS. These ELs encompass an area of approximately 16,000 km². While exploration drilling may occur on any one of these Els, is it extremely unlikely that all 30 potential exploration wells would be drilled on the ELs that intersect the Project Area. Cumulative effects associated with the proposed BdN Project and other past, present or planned activities are addressed in Chapter 15 with additional information provided in response to IR-220/Conformity DFO-5.

IR-123	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 9.2.3.2
CEAA-53		
Context/Rationale	In Section 9.2.3.2 of the EIS, reference is made to water-based mud studies at other projects and from the Grand Banks production projects environmental effects monitoring results. The EIS notes that WBM was detected using heavy metal and or barium tracers to extend out to two kilometres. However, the Grand Bank production projects are in a different marine environment from the Bay du Nord deep water location and the Project Area on the slope, both areas are exposed to different oceanographic regimes. The	

	comparison between the observed shallow water production project effects and the proposed deep water project is required to assess potential effects.
Request 15-Apr-19	Describe the applicability of observed shallow water drill mud and cutting dispersion with predicted cuttings dispersion in the Bay du Nord deep water project site.
Equinor Response 15-Nov-19	Refer to the responses for the following: IR-125/ CEAA-55, IR-126/CEAA-56 and IR - 226/DFO-110 The potential effects of drilling wastes on the environment is described in Section 9.2.3.2 of the EIS and includes references to exposure experiments, field studies, and monitoring programs. Monitoring programs for oil producing projects on the Grand Banks have been considered as part of describing the potential environmental effects. It is recognized that the BdN Project is in deeper waters than current producing projects, therefore site-specific modelling of drill cuttings (Appendix E) that considered local currents and substrate composition, was conducted as part of the environmental assessment. Updates to the EIS are not required.

IR-124 **CEAA-54**	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 9.2.3.2
Context/Rationale	In Section 9.2.3.2 of the EIS, reference is made to synthetic-based mud studies at other projects and at the Grand Banks production projects environmental effects monitoring results. The EIS notes that SBM was detected using toxicity tests to extend out to tens of metres. However, the Grand Bank production projects are in a different marine environment from the Bay du Nord deep water and future project locations and exposed to a different oceanographic regime. The EIS notes that other research studies were referenced for degradation, potential and hypoxic water and sediment conditions, but no comparisons were provided of site similarities with Bay du Nord. Site specific information needs to be considered in the EIS to assess effects. The cutting modeling suggests a potential maximum cutting pile thickness of 11.7 metres for eight wells. It was stated that this height will be reduced by slumping and weathering yet the mechanical processes for weathering are not discussed for this deep water site. Oceanographic information provided in Section 6 does not appear to be considered in weathering statements.	
Request 15-Apr-19	A. Provide deep water project effects analysis to make predictions on potential toxicity zone of influence of settled drill mud and cutting. B. Describe the change in benthic habitat and habitat complexity and the mechanisms for reversibility from an 11 metre high cutting pile to baseline condition.	
Equinor Response 15-Nov-19	As described in Section 2.7.4.4 of the EIS synthetic based mud (SBM) cuttings are treated in accordance with the Offshore Waste Treatment Guidelines (OWTG; NEB et al. 2010) before being discharged near the surface. As indicated in Section 9.2.3.2 and Appendix I, SBM drill cuttings become highly dispersed in the deep-water environment and are not likely to form any aggregations above the PNET (refer to Section 5.1.3 and 5.2.3 of Appendix I). Therefore, potential effects in water depths of approximately 1,200 m would likely be lower than described for other projects in shallower water depths. Additional information on the potential effects of cuttings deposition is described in response to IR-226/DFO-110.	

	The modelled deposition of cuttings approximately 11-m high was based on a sediment particle size distribution from Troll A, which as described in Appendix I and restated in response to IR-35/CEAA-23, is provided to reduce uncertainty regarding particle size distribution (PSD) data. The modelled scenario using a local sediment particle size distribution resulted in a cuttings deposition that was approximately 2.7 m high at less than 10 m from the discharge point. Drill cuttings that form mounds around the drill site are largely water-based mud cuttings that are released near the seabed during the riserless phase of drilling. Water based muds are non-toxic in nature, however as described in Section 9.2.3.2 of the EIS, there are adverse effects associated with burial and creation of anoxic environments that are localized to the cuttings pile. The mechanisms of sediment transport and recovery of seafloor sediment is presented in response to IR-274/CEAA-26. Recovery of WBM cuttings piles are described in Recovery and Recolonization in Section 9.2.3.2 of the EIS. For clarity, the text in Section 9.2.3.2 – Recovery and Recolonization will be amended to include the following: "…At a drilling operation in the northeast Atlantic, polychaete pioneer species were observed colonizing the drill cuttings piles one year after the initial discharge and experimental evidence indicates similar species initially colonized WBM drill cuttings in Norway (Gates et al. 2017). ***Examining the results from ongoing EEM programs for the offshore production operations, specifically Terra Nova and Hibernia, these EEM programs showed recovery at drilling locations where drilling had ceased, and cuttings were no longer discharged. The Terra Nova Project discharged WBM drill cuttings (54,622 m³) and SBM drill cuttings (6,320 m³) from 2000 to 2009 (Deblois et al. 2014a). There was an overall decrease in hydrocarbon and barium level within 1 km of the drill centers, consistent with reduction in drilling activities from 2006-2008 and suggests post-drilling recovery from degradation or sediment transport (Deblois et al. 2014 a,b). For the Hibernia Platform, hydrocarbon and barium levels have generally declined after installation of a cuttings reinjection system in 2002 to 2014 where SBM cuttings are not discharged into the environment, indicating recovery. A slight increase in these parameters was observed in 2016 and was likely associated with limited SBM discharges in 2015-2016 for certain situations to ensure the integrity of the cuttings re-injection system (HMDC 2019).***" References: DeBlois, E.M., E. Tracy, G.G. Janes, R.D. Crowley, T.A. Wells, U.P. Williams, M.D. Paine, A. Mathieu, and B.W. Kilgour. 2014a. Environmental effects monitoring at the Terra Nova offshore oil development (Newfoundland, Canada): Program design and overview. Deep Sea Research Part II: Topical Studies in Oceanography, 110: 4-12. ***DeBlois, E. M., Paine, M. D., Kilgour, B. W., Tracy, E., Crowley, R.D., Williams, U.P., and G.G. Janes. 2014b. Alterations in bottom sediment physical and chemical characteristics at the Terra Nova offshore oil development over ten years of drilling on the grand banks of Newfoundland, Canada. Deep Sea Research Part II: Topical Studies in Oceanography, 110, 13-25.*** ***HMDC; Hibernia Management Development Company. 2019. Hibernia Platform (Year 10) and Hibernia Southern Extension (Year 3) Environmental Effects Monitoring Program (2016): Volume I – Interpretation. Available from: https://www.cnlopb.ca/wp-content/uploads/eem/eem2016hib.pdf***

IR-125 **CEAA-55**	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 9.2.3.2
Context/Rationale	In Section 9.2.3.2 of the EIS, the discussion of suspended sediments and sedimentation from drill cuttings refers to a study on water-based mud where effects of eutrophication and oxygen depletion impacted benthic species diversity and abundance. The earlier section on water based muds stated that potential effects are primarily associated with the physical abrasive effects of ingesting mud particles. There is inconsistence in the range of effects on the benthos. It appears that finfish are excluded from this analysis without explanation. The EIS reports that coral and sponges are exposed to episodic pulses of suspended solids and thus adapted to tolerate exposure to natural and drill cuttings. However, neither Section 5 nor 6 of the EIS provided information on the natural disturbance regime in the Core BdN Project Area or Project Area to condition the existing coral and sponge to withstand changes in water quality from drill wastes.	
Request **15-Apr-19**	A. Provide a rationale for why finfish and other species besides *L. pertusa* or *Geodia spp*., that are part of the deep water ecosystem in the Project areas, were not considered in the effects analysis and the description of ecological value. B. Provide a rationale for why the synthetic-based mud cuttings model predictions were not included in Section 9.2.3.2 of the EIS. C. Update the environmental effects analysis, taking into account the methodology in Section 4, information in Section 5 and 6 of the EIS, and literature on ocean disposal studies on effects of sediment and sedimentation, on the benthic effects of drill waste disposal.	
Equinor Response **15-Nov-19**	Refer to responses to the following: IR124/CEAA-54, IR-126/CEAA-56, IR-127/CEAA-57, IR 226/DFO-110, and IR-252/CEAA-102 A. The effects of WBM and SBM associated cuttings on the environment are described in Section 9.2.3.2 including information on toxicity, bioaccumulation, burial and suspended particles. Descriptions of the existing environment within the Project Area are described in Section 6.1. The information presented to support the effects assessment included published scientific studies, monitoring reports, and project specific modelling of WBM and SBM drill cuttings discharge. The discussion included potential effects of WBM and SBM cuttings on a variety of invertebrate and fish species Potential burial and suspended sediment effects of drill cuttings are considered limited for mobile finfish species due to their capacity for avoidance (See IR-127/CEAA-57). Additional information was provided on sessile invertebrate species that have limited capacity for avoidance of burial and suspended effects from drill cuttings. As many sessile invertebrates feed on suspended particles in the water column, they are at further risk of ingestion of drill cuttings particles relative to mobile fish and invertebrate species. The cold water reef coral *Lophelia pertusa* is unlikely to occur within the Project Area. However, the cold water reef coral has been well studied in relation to potential effects from oil and gas projects in the North Sea and Gulf of Mexico (i.e., Larsson and Purser 2011; Allers et al. 2013; Purser 2015; Baussant et al. 2018). Information was presented to indicate potential effects on cold water corals in the area as direct exposure studies on Northwest Atlantic corals are limited. B. The drill cuttings modelling considered discharge both SBM and WBM cuttings. As potential effects from drill cuttings are mainly localized to the drill cuttings area and burial was a main potential effect on sensitive sessile benthic species (see Section	

	9.2.3.2 of the EIS), total cuttings (SBM + WBM) was presented in relation to deposition thickness. C. The effects of WBM and SBM associated cuttings on the environment are described in Section 9.2.3.2 including information on toxicity, bioaccumulation, burial and suspended particles. The information presented to support the effects assessment included published scientific studies, environmental effects monitoring reports, and project specific modelling of WBM and SBM drill cuttings discharge. The discussion included potential effects of WBM and SBM cuttings on a variety of invertebrate and fish species. This information was considered and used as part of the effects assessment of the Project as described in Section 9.2.3.2 and 9.2.3.3. The effects assessment is complete. Updates to the EIS are not required. References: Allers, E., R.M.M. Abed, L.M. Wehrmann, T. Wang, A.I. Larsson, A. Purser, and D. de Beer. 2013. Resistance of *Lophelia pertusa* to coverage by sediment and petroleum drill cuttings. Marine Pollution Bulletin, 74(2013): 132-140. Baussant, T., M. Nilsen, E. Ravagnan, S. Westerlund, and S. Ramanand. 2018. Effects of suspended drill cuttings on the coral *Lophelia pertusa* using pulsed and continuous exposure scenarios. Journal of Toxicology and Environmental Health, Part A, 81(10): 361-382. Larsson, A.I. and A. Purser. 2011. Sedimentation of the cold-water coral *Lophelia pertusa*: Cleaning efficiency from natural sediments and drill cuttings. Marine Pollution Bulletin, 62(2011): 1159-1168. Purser, A. 2015. A time series study of *Lophelia pertusa* and reef megafauna response to drill cuttings exposure on the Norwegian margin. PLOS One, 10(7).

IR-126	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 9.2.3.2
CEAA-56		
Context/Rationale	In Section 9.2.3.2 of the EIS, the reference to the seabed recovery studies do not provide the existing environmental conditions or species information at those sites to allow for comparison with the Core Bay du Nord Area and Project Area. The ROV and AUV surveys in 2018 do not appear to cover previous exploration well sites to evaluate deep water drill site recovery. This information is important to describe the existing environmental conditions and to understand the effects assessment.	
Request **15-Apr-19**	A. Provide habitat mapping and associated seafloor community information using the site specific survey data to allow for a determination of measurable changes in natural variability of marine biota (not solely corals, sponges and sea pens) and habitats. B. Explain if Equinor's exploration well sites were surveyed to support the project specific assessment of drill waste recovery. C. Describe recovery potential and recovery mechanisms of seafloor habitat and communities using site specific ecosystem information such as the species present and their life history information (i.e. sexual maturity, fecundity, dispersion, colonization strategies, etc.) that relates to recovery.	
Equinor Response **15-Nov-19**	A. In the February 2019 version of the EIS, a subset of coral and sponge survey data collected in 2018 were included to describe fish habitat in the areas where subsea infrastructure is likely to installed, based on preliminary BdN project design	

requirements. As indicated in the meeting with DFO staff of July 9, 2019, the subset of data were chosen as representative data for the area, as habitat features appear to be contiguous in the areas surveyed. Sensitive corals, such as *Lophelia pertusa*, were not identified in any of the sites surveyed. It is Equinor Canada's opinion that the level of detail provided in the EIS is sufficient to determine potential impacts to fish habitat associated with the BdN Development, consistent with the use of an environmental assessment as a planning tool for the overall BdN development. Equinor Canada acknowledges that additional fish habitat data may have to be collected should a *Fisheries Act* authorization respecting fish habitat be required.

DFO and CEA Agency have indicated that additional data are required in the EIS in order to make a regulatory determination of the significance of potential impacts. As the coral survey data are still being processed, the following information will be included in the EIS to provide additional information regarding corals and sponges in the Core BdN Development area to provide further confidence in Equinor Canada's determination of significance:

- Information regarding the subsampling spread in the area and along different habitat types/areas (based on MBES data) will be included to show that it is representative of the area, with a focus on the drilling templates areas.
- As described in the EIS, Project design is ongoing. The February 2019 EIS provided a preliminary layout design for the subsea infrastructure (see attached Figure from 2019 EIS). To account for potential changes to the subsea infrastructure layout, a distance of 1.5 km (a buffer zone) around each of the original locations for the drilling templates, flowline corridors and FPSO will be examined to provide the following information:
  - Based on the MBES and side scan data collected during the 2018 Seabed survey, it was determined that all hard targets within the 20 cm resolution of the MBES were identified as showing the presence of corals and/or sponges. Therefore, it is proposed that the EIS will include the MBES / side scan data identifying all hard targets on seafloor within this 1.5 km buffer zone. The likely presence of corals and sponges, excluding seapens, on these hard targets can be extrapolated and estimated based on occurrence data collected during the 2018 survey. Using the species occurrence data presented in the draft EIS, an estimate of percentage occurrence data in the buffer area surrounding the templates and flowline corridor can be provided.
  - In the Fisheries Closure Area, a Special Area, which is predominantly sea pens and soft substrate with minimal hard targets, it is proposed to provide an estimate of the potential footprint of subsea infrastructure and cuttings depositional area in the FCA. Using the 2018 survey data presented in the EIS, an estimate of potential occurrences of sea pens will be provided for a 1.5 km buffer area surrounding the templates and flowline corridor in the FCA.
  - Representative photos of typical areas showing density levels will be provided

The following text will be added to Chapter 6. Note where tables have been updated, based on the revisions to the EIS, the revised tables are included as Appendix E to this Response Document and are noted in the footnotes.

<u>Section 6.1.1.5 – 2018 Seabed Survey</u>

"In 2018, in order to support ongoing Project design and to provide benthic and fish habitat information for the Core BdN Development Area, Equinor Canada

	completed a seabed survey in representative locations (Figure 6-3). The areas chosen were based on the currently proposed subsea layout*. **Upon completion of final subsea layout design, the area occupied by the final layout design will be compared against the layout used in the 2018 survey. Based on the final design, if there are areas where subsea infrastructure will be installed on the seafloor that were not captured by the 2018 survey, these areas will be surveyed to collect coral, sponge and/or sea pens data.*** ~~As design is ongoing, and if there are changes to the subsea layout, where there is no previous data for these areas, additional data may be collected.~~ The sea bottom was surveyed via remotely operated vehicle (ROV) and autonomous underwater vehicle (AUV). A summary of the data is provided in Sections **Error! Reference source not found.**, **Error! Reference source not found.**, and **Error! Reference source not found.**. The 2018 survey methodology was reviewed and accepted by the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) and DFO prior to commencement (see Section 3.2 ***and Appendix [##]***). ***The survey design considered that design changes may be required in the field as appropriate. Due to technical difficulties and site constraints, survey methodology was adjusted during the field program to collect as much visual data possible with the resources available. Figure 6-3[1] illustrates areas where ROV and AUV data collected.*** ROV video was collected approximately 1 m above the seabed at speeds of < 1 km/hr along pre-determined transects within 500 m of proposed well template locations. The AUV captured seabed imagery from approximately 4 m above the seabed within 500 m of proposed well template locations and along potential flowline infrastructure footprints. At least ***56*** percent of ***ROV video*** ~~8~~ of ***31*** percent of ***AUV images*** were analyzed as representative data for the area. This information is presented below for the southern (sites P1 and P2), central (P3***, P7,*** P8***, P9,*** and P10) and the eastern sites (P4a, P4b, and P4c). The eastern sites are in a NAFO fisheries closure area (FCA) (see Section **Error! Reference source not found.**). Videos and image mosaics were analyzed for animals (macrofauna), plants (macroflora), and substrate as detailed for the 2016 exploration wellsites survey. ROV videos were analyzed in 5-minute sections ***within a 200 m radius of planned subsea infrastructure, and the remaining sections*** were randomly subsampled from the ROV tracks (Figure 6-3)***.*** This methodology provided ~~120 minutes of video analyzed at each target location out of approximately 18 hours of video data captured at each target location for~~ a total of ~~11~~***56*** percent visual data reviewed. At ~~the eastern area~~ ***site P4b***, due to technical difficulties, ROV coverage was limited and ~~only~~ approximately 75 min of video was recorded***, all of which was analyzed***. ~~Therefore, six random segments of 5-minutes were reviewed, providing 30 minutes of coverage or 40 percent.~~ The AUV collects still pictures every 3 seconds as it transits, therefore for each picture there is spatial overlap with the preceding picture…" **<u>Section 6.1.7.5 – 2018 Seabed Survey</u>** "Based on visual data, substrate in the southern area of the Core BdN Development Area (survey stations P1 and P2) was ***approximately 93*** percent mud, ***5*** percent boulders, ***<1*** percent rubble, and ***<1*** percent cobble. Substrate was similar in the central area (P3, ***P7***, P8, ***P9***, and P10), and was comprised of ***approximately 92*** percent mud, ***4*** percent boulders, ***2*** percent rubble, and 1 percent cobble. Where rocks of any size were observed, soft corals or sponges

[1] Figure 6-3 was included in the February 2019 EIS.

were present in ***nearly*** 100 percent of cases. Species that require attachment sites (soft corals and sponges) were also observed regularly between rocks, indicating the likely presence of hard substrate below surface sediments. The eastern survey area included sites P4a, P4b, and P4c that were predominantly covered in mud substrate. Bottom type in P4a based on subsampled ROV video was approximately ***99*** percent mud, ***<1*** percent boulders and ***<1*** percent rubble. Survey site P4b and P4c was ***almost 100*** percent mud and ***<1 percent boulders*** based on reviewed ***ROV and*** AUV images. ***Substrate totals do not necessarily total 100% due to rounding.***

Using multi-beam echosounder (MBES) data collected using the AUV, hard targets over 20 cm were identified within 1.5 km of each drill centre (Figure 6-8, Figure 6-9). The southern area (P1 and P2) had 3,005 hard targets together, with P2 having 177 more targets than P1 and the highest amount overall (Figure 6-8). The central area (P3) had 1,861 hard targets and the eastern area (P4a and P4b) had 1,474, with P4a having 612 more targets than P4b (Figure 6-9). As stated above, species from the soft coral functional groups or sponge functional groups were present on nearly all rocks observed during the ROV and AUV survey. Conservatively, it is assumed that all of these hard targets are likely to have soft corals and / or sponges present.

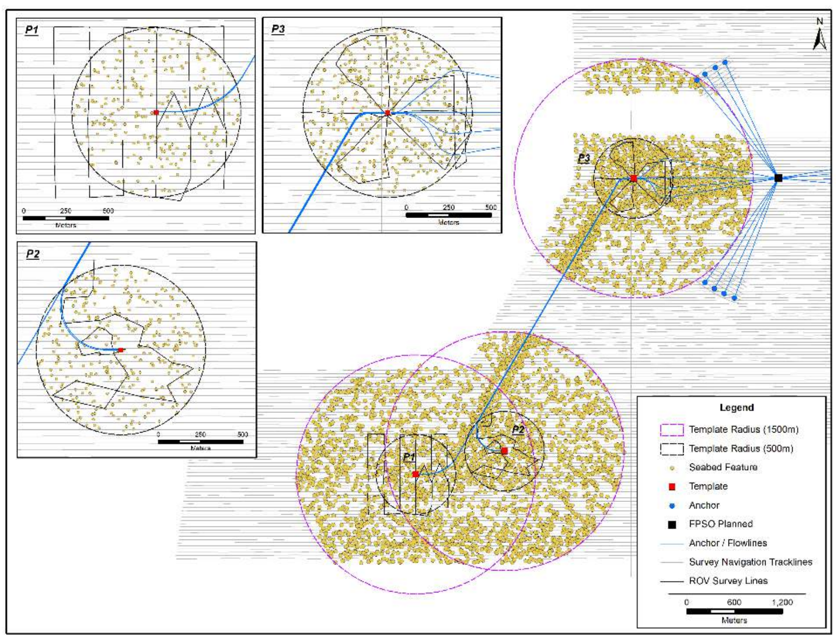


Figure 6-8 Multi-beam echosounder identified hard targets within 1.5 km of proposed drill centres in the southern and central Bay du Nord area.

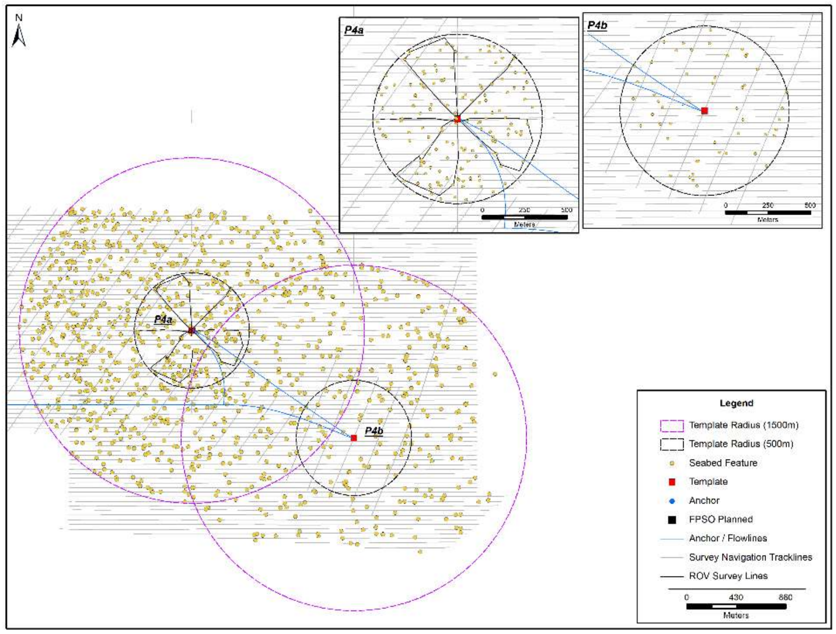


Figure 6-9 Multi-beam echosounder identified hard targets within 1.5 km of proposed drill centres in the eastern Bay du Nord area.

Corals, sponges, and echinoderms were typically the most abundant and distributed macrofauna in southern and central areas (**Error! Reference source not found.**[2]). Soft coral species (Family Nephtheidae) dominated the coral group and sponges observed were primarily comprised of ***the solid / massive sponge functional group.*** ~~*Geodia* sp.~~

Echinoderms observed were primarily sea urchins ~~*Phormosoma placenta*~~. In the southern area, these three species groups accounted for ~~76.3~~***61*** to ***83*** ~~82.0~~ percent of macrofauna observed and were well distributed across survey areas. Sponges were observed in 65.0 to 81.7 percent of survey sections and corals were observed in ~~66.7~~***67*** to ***90***~~82.5~~ percent of survey sections. Echinoderms were also distributed in ~~60.0~~***81*** to ***97***~~85.8~~ percent of survey sections.

In the central area, ***corals, sponges, and echinoderms were the most common groups, with cnidarians becoming more prevalent toward to western site (P10).*** Sponges and corals were present in ~~57.4~~***94*** to ~~85.8~~***100*** and ~~52.5~~***67*** to ***100***~~80.8~~ percent of survey sections, respectively. Echinoderms were distributed in ~~37.0~~***94*** to ~~82.5~~***100*** percent of survey sections, ***with sea urchins as the predominant group***. ~~Species distributions in the central area were similar among P3 and P8, with lower sections present across species groups in P10 (flowline).~~ ***Nephtheid soft corals were the predominant coral group, and solid / massive sponge functional group were the predominant sponges.***

In the eastern area, corals, other cnidarian species (anemones and jellyfish), and ~~echinoderms~~ ***corals*** were the most commonly observed macrofauna (**Error! Reference source not found.**). Corals ***and*** other cnidarians~~, and echinoderms~~ accounted for ~~81.5~~***71*** to ~~88.9~~***90*** percent of macrofauna observed. Corals were observed in ~~57.4~~***86*** to 100.0 percent of survey sections across ROV and AUV

2 Updated Table 6.10 can be found in Appendix E to this Response Document.

	surveys ~~with highest distribution at P4b.~~ Jellyfish and anemones were present in ~~20.6~~***81*** to ~~93.3~~***100*** percent of survey sections ~~with highest distribution at P4b.~~ Echinoderms had relatively lower distribution and were observed in ~~21.3~~***75*** to ***100***~~66.7~~ percent of survey sections and were mainly comprised of ~~an unidentified~~ sea stars. Corals in this area were ***predominantly*** sea pens. ~~The most commonly encountered sea pen was *Pennatula* sp. and t~~***The*** most common non-coral cnidarian ***group*** ~~were Cerianthid (tube-dwelling)~~ ***was*** anemones. ***Few*** soft corals and sponges were observed in ***the Eastern areas***, likely due to the lack of hard substrate and rocks in the area." ~~This is likely due to the uniform composition of the substrate and general lack of hard substrates and rocks that support colonizing species"~~ **Section 6.1.7.6 – Corals and Sponges** **Corals** ~~"Twenty-nine species of coral have been observed within the Project Area with 23 species observed during the Equinor Canada 2018 Seabed Survey (Table 6.11, Table 6.12)."~~ More than 80 species of corals and sea pens have been observed in the vicinity of the Project Area (Table 6.11)[3]…(Wareham 2009; Murillo et al. 2011; Beazley et al. 2013a, Vázquez et al. 2013; Baillon et al. 2014a, 2014b; Beazley and Kenchington 2015; Miles 2018). Dominant coral ~~species~~ ***functional groups*** in the Project Area were sea pens and soft corals (**Error! Reference source not found.**~~, **Error! Reference source not found.**~~) based on Canadian and EU RV surveys and the Equinor Canada 2018 Seabed Survey…Canadian RV surveys in this area capture large quantities of soft corals at these depths, so the numbers observed appear to be typical for the area. ~~Soft corals in the seabed surveys were primarily of the family Nephtheidae.~~ In Canadian RV surveys…predominance of mud substrates. Sea pens were common at all seabed survey sites but were the dominant coral group in eastern survey areas. ~~*Anthoptilum grandiflorum* and *Pennatula* spp. were the most commonly observed species across areas.~~ In EU RV surveys…Baker et al. (2012b) observed up to 622 *Pennatula* sp. individuals per 10 m transect in the Desbarre Canyon (southern Grand Banks) whereas the highest density for the seabed survey was approximately ~~12~~ **14** individuals per 10 m transect. A recent modelling…(Kenchington et al. 2018). Other coral ***functional*** groups, including ~~gorgonian~~ ***branching*** corals, black~~wire~~ corals, and ~~cup~~ ***hard*** corals, were not commonly observed in the Project Area in Canadian and EU RV surveys…*Keratoisis* sp. colonies that have been observed to reach more than 1 m height regionally (Baker et al. 2012b; Beazley et al. 2013b) and have been associated with various sponge species (Dinn and Leys 2018). ~~However, the *Acanella* sp. was only observed during the AUV survey in P4b and P4c, in solitary clumps at very low densities (no more than two observed in a single AUV picture) and no species of *Keratoisis* was observed. The cup coral *Flabellum* sp. was only observed sporadically and in low abundances throughout the survey. The observed is reflected in~~ Canadian RV surveys indicate that stony cup corals were present in six percent of trawls mainly on the slopes in the Project Area." **Sponges** ~~"Twenty species of sponge were observed within the Core BdN Development Area (Table 6.16 to **Error! Reference source not found.**)."~~"At least 32 species of

[3] Updated Table 6-11 can be found in Appendix E to this Response Document.

	sponges ~~(Table 6.18)~~ have been observed in the vicinity of the Project Area (**Error! Reference source not found.** and **Error! Reference source not found.**, Murillo et al. 2012; Beazley et al. 2013a; Knudby et al. 2013; Beazley and Kenchington 2015)… …Equinor Canada Seabed Surveys (2016 to 2018) indicated that the ***solid / massive sponge functional group*** ~~*Geodia* sp.~~ were the most abundant sponge ~~species~~ ***functional group*** in the Core BdN Development Area, occasionally forming dense aggregations (more than 0.75 individuals/m^2) (**Error! Reference source not found.**, **Error! Reference source not found.**). ~~Geodid~~ The ***solid / massive sponge functional group*** was primarily observed in the southern and central areas, whereas sponge distribution was low in eastern areas (***Table 6.15***). Sponge grounds are known to occur within the Flemish Pass, typically with ~~other~~ genera such as *Stryphnus* and *Stelletta*. However, though fewer in number, some key habitat-forming ~~glass sponge~~***thin-walled, complex sponges*** ~~species~~ were observed in the Project Area~~including *Asconema* sp. and glass sponges from the family Rossellidae. These~~ ***This group*** existed at very low densities, with the exception of a ~~single~~ dense aggregation of ***thin-walled, complex sponges*** ~~*Asconema* sp.~~ observed growing on a fishing net found in P4a…" **Section 6.1.8.4** **2018 Seabed Survey** Various fish species were also observed at the survey locations generally at low densities (**Error! Reference source not found.**, **Error! Reference source not found.**). ***Fish species were placed into functional groups, with small, medium, and large benthivores grouped together due to difficulty identifying certain fish groups to species (Ollerhead et al. 2017, Wells et al. 2019).*** Some of the observed organisms could not be identified to a ***functional*** group and were ~~assigned a unique moniker (i.e., Fish 001) and are~~ counted as '~~unidentified'~~ ***unknown' (Table 6.24, Table 6.25)***~~(Table 6.27)~~. ***Four wolffish observed at P2 (three northern and one spotted) and one observed at P4b (likely Atlantic)*** ~~Spotted wolffish (one individual, P2 survey site)~~ and grenadiers (likely roundnose, all sites) were the only species of conservation concern observed during the survey. ~~Six species of skate were seen (abyssal skate and five unidentified) during this survey. The abyssal skate is not of conservation concern, though further identification of the unidentified skates may reveal a species of concern.~~ ***Several skates were identified in this survey, potentially including the abyssal skate, thorny skate (SAR), or spinytail skate (SAR; see 6.1.9 for more details).*** Redfish were observed during ROV operations but not observed in the subsampled video review. Overall, ***benthivores were the most common functional group of fish, of which*** grenadiers and longnose eels were the most common ~~fish~~ species encountered (***Table 6.24, Table 6.25***). These species are common in Canadian and EU RV trawls, though other commonly encountered species in trawls such as lanterfishes, Greenland halibut, and blue hake were ~~only seen at very~~ ***observed at*** low densities in these surveys. Similar species were seen in the Project Area during the NEREIDA survey. B. See response to IR-38/CEAA-28 Part B. C. Information on environmental effects on benthic habitats, including recovery, is included in Section 9.2.1, 9.2.2, 9.2.3 and 9.2.6 and addressed in responses to IR-107/CEAA-36; IR-124/CEAA-54, IR-127/CEAA-57; IR-226/DFO-110 and IR-252/CEAA-102.

IR-127 **CEAA-57**	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 9.2.3.2
Context/Rationale	Section 9.2.3.2 of the EIS states that the influence of surface discharging SBM cuttings is not expected to result in a substantial interaction with pelagic species. However, it is not clear what evidence was used to support the conclusion, what species were considered or their tolerance. The mechanisms of high settling or turbidity effects on suspended phytoplankton is not provided. The duration of suspended WBM mud and cuttings and SBM cuttings is not provided to determine the range of effects on suspension feeding organisms. In Section 9.2.3.2 of the EIS, ambient measures of turbidity or suspended solids were not considered in the magnitude of the effect. The EIS predicts that about 22% of the cuttings material will not settle. The predicted concentration of suspended cuttings material was not provided. It is unclear how the dispersion of 22% of drill waste more than 23 km is considered localized in the effects rating.	
Request **15-Apr-19**	A. Update the effects analysis of marine biota using the modelled zones of influence and natural variability of existing water quality information to substantiate project effect assessment of measurable changes in turbidity and suspended solids that are either within or beyond natural variability. B. Given the predictions of 22% of cuttings material being continually suspended, provide an analysis of fish species susceptible to elevated turbidity and suspended solids. C. Review the geographic extent rating for the dispersion of suspended cuttings material.	
Equinor Response **15-Nov-19**	A. The effects of WBM and SBM associated cuttings on the environment are described in Section 9.2.3.2 including information on toxicity, bioaccumulation, burial and suspended particles. In a review on the effects of discharged drill cuttings, the risk to marine water column organisms was considered low due to the rapid dilution and dispersal of drill cuttings and low toxicity of drilling fluids (IOGP 2016). Furthermore, mobile finfish and invertebrates are able to avoid areas of suspended drill cuttings, minimizing exposure and potential effects (IOGP 2016). For clarity, the following text will be included in Section 9.2.3.2 of the EIS: "The overall result of these potential effects is a localized decreased species abundance and diversity of benthic organisms within approximately one kilometre of the source (Neff et al. 2000; Holdway 2002; Schaanning et al. 2008; Trannum et al. 2010; Gates and Jones 2012; Larsson et al. 2013; Cordes et al. 2016; Tait et al. 2016). ***The discharge of drill cuttings into the water is predicted to result in localized and temporary suspended sediments and turbidity (Smit et al. 2008), however due to the low toxicity of drill cuttings and rapid dilution and dispersion, the risk to pelagic organisms is considered low (IOGP 2016). In a modelling study of drill cuttings in the South China Sea, discharged suspended drill cuttings were estimated to drift greater than 200 m from the source (Koh and Teh 2011). Suspended solid levels in the water column returned to background levels within two hours of discharge cessation indicating potential effects are non-persistent and temporary (Koh and Teh 2011). Elevated turbidity levels may decrease light exposure to phytoplankton required for photosynthesis, however such suspended solids concentrations would be limited to within 25 m of the discharge source***	

	(IOGP 2016). Another modelling study characterized the potential effects of drill cuttings suspended particles and turbidity for the Norwegian Continental Shelf (Veltman et al. 2011). The potential effects of suspended particles from oil and gas platforms had minor effects on the water column with limited contribution to impacts at regional (2%) and global scales (0.6%) (Veltman et al. 2011). Furthermore, mobile finfish and invertebrates are able to avoid areas of suspended drill cuttings, minimizing exposure and potential effects (IOGP 2016)." B. Drill cuttings are diluted and dispersed in the water column and are therefore temporary in nature (IOGP 2016; Koh and Teh 2011, Veltman et al. 2011). The drill cuttings have low toxicity and turbidity effects also rapidly decline after cessation of discharge (Koh and Teh 2011). Therefore, as described above, the potential effects on mobile finfish species in the water column are considered low in magnitude. The effects assessment is complete and the EIS does not require an update C. The potential adverse effects of SBM discharge associated with suspended solids and turbidity remains low in magnitude. As approximately 22 percent of drill cuttings are highly dispersed and drift more than 23 km away from the wellsite, outside the model domain, the geographic extent is within the LSA. For clarity the text Section 9.2.3.2 of the EIS will be amended to read as: "In summary, with the application of mitigation measures, the residual environmental effects on Marine Fish and Fish Habitat resulting from drilling discharges and emissions are predicted to be adverse, low in magnitude, ***within the LSA***, medium to long-term in duration due to recolonization of drill cuttings, occurring regularly during drilling activities, and reversible. This prediction is made with a high level of confidence." References: IOGP. 2016. Environmental Fate and Effects of Ocean Discharge of Drill Cuttings and Associated Drilling Fluids from Offshore Oil and Gas Operations. IOGP Report 543. ***Koh, H.L., and S.Y. Teh. 2011. Simulation of drill cuttings dispersion and deposition in South China Sea. In Proceedings of the International Multi Conference of Engineers and Computer Scientists (Vol. 2).*** ***Veltman, K., Huijbregts, M.A., Rye, H., and E.G. Hertwich. 2011. Including impacts of particulate emissions on marine ecosystems in life cycle assessment: The case of offshore oil and gas production. Integrated environmental assessment and management, 7(4), 678-686***.

IR-128	**Guideline Ref:** Part 2, Section 7.3.1; Section 7.3.8.3	**EIS Ref:** Section 9.2.3.2; Section 12.2.3.1; Section 15.2.4
DFO-20 **CEAA-61**		
Context/Rationale	Section 9.2.3.2 of the EIS indicates that recolonization of the drill cuttings pile may start as early as one year after cessation of activity with diminished effects three to ten years after cessation of activity. This conclusion is not supported by the information provided. Section 9.2.3.2 of the EIS notes "maximum cuttings thickness for the Troll A platform case from 200 m to 1 km from the wellsite is around the 1.5 mm PNET" but subsequently states "based on the modelling results, the potential interaction with these species would be limited to within 200 m from the wellsite".	

	In Section 9.2.3.2 in the EIS, only invertebrates were considered for effects of drilling development wells; however, effects on the entire marine ecosystem, at least key indicator species, needs to be understood for a meaningful analysis. Smothering, toxic and deoxygenated sediment, and elevated suspended solid conditions are considered low magnitude effects, but do not appear to match the definition of that rating. Natural variability was not described in the EIS to substantiate the determination if detectable changes in marine fauna that may be within or beyond natural variability. Mitigation of drill waste relates only to synthetic mud residual oil concentrations and not the volume of mud or cuttings used. Effects from literature studies were not compared for relevance with site conditions at the Core BdN Development Area. The medium to long term duration is not explained in this context of recovery. The sexual maturity and recolonization life history details of diverse benthos communities does not appear to be included in predicting the duration of effects. There is no consideration of the ecological value of the species in the Core BdN Development Area and the long term loss of a portion of that ecosystem and food web. The reversibility rating to baseline conditions was not based on consideration of baseline conditions in terms of habitat or habitat complexity. The confidence in this rating is high without providing pertinent information from recent deep sea surveys of drilled well sites in the Core BdN Development Area. Site specific information is needed to understand the rationale and linkage between the existing information, effects analysis method, literature cited and the conclusions. In Section 12.2.3.1 of the EIS conclusions of recolonization are made without consideration of life history (fecundity, grow rates, sexual maturity, etc.) or population dynamics (species distribution, source populations, etc.) of recolonizing marine fauna and the dynamics to return sediment quality back to natural conditions. The rate of recolonization appears to be based on shallow water observations in the cited literature. Section 15.2.4 of the EIS cites scientific literature that notes deep water corals may take decades to 100s of years or more to recolonize to former mature conditions. Because of low water temperatures, low food supply, slow growth, reduced metabolic rates, episodic recruitment and long life spans, predicted recovery from impacts can be prolonged. This information is not considered in the effects analysis ratings on cumulative effects of the Project and by other projects, in particular Equinor's exploration drilling in the Project area (see Figure 7-47 in the EIS).
Request 15-Apr-19	A. In Section 9.2.3.2 of the EIS, update recovery and recolonization to reflect corals and sponges. B. Provide rationale for use of 200 metres for potential interaction, when modelling (Troll A) shows 1.5 mm PNET out to one kilometre. C. Provide a rationale for why only invertebrates were used in the effects analysis of drilling development wells. D. Review the effect descriptors with the effects rating conclusions for consistency. E. Describe the measurable changes in natural variability in the effects analysis for each project activity. F. Describe the mitigation the proponent intends to use to mitigate the effects from the high volume discharge of mud and cuttings used for drilling in Special Areas.

	G. Explain the relevance between the project sites in the cited literature effects and those predicted effects at the deep water Bay du Nord Core site and other future development sites. H. Provide supporting rationale for the medium to long term duration rating for recolonization of the diverse benthic ecosystem to take into account the ecological values of key species and habitats, and where the potential for permanent loss is a possibility. I. Revise the cumulative effects conclusion on recovery rates and recolonization of benthic fauna from exploration drilling and production drilling projects in the Project areas that may or may not physically overlap, but where there may be a cumulative removal of sensitive ecosystems through habitat and community fragmentation.
Equinor Response 15-Nov-19	A. Refer to response to IR-126/CEAA-56 Part C and IR-274/CEAA-26 B. As presented in Section 9.2.3.2 and clarified in response to IR-226/DFO-110, the drill cutting modelling results estimate that for the base case, with flocculation and Troll A Average PSD, the median deposition will be below the 1.5 mm and 6.5 mm predicted no effects thresholds (PNET) at less than 200 m from the modelled release site for up to 8 wells. C. In accordance with Section 3.2 of the EIS Guidelines, the effects assessment is focused on those interactions that are likely to have the greatest effect on the VC. As presented in Section 9.2.3.2 and clarified in response to IR-125/CEAA-55, additional information was presented in the effects assessment on benthic invertebrates as they have low capacity for avoidance of drill cuttings deposition relative to mobile finfish and invertebrates. Information was also presented on corals and sponges that are have important roles in the ecosystem (refer to response in IR-251/CEAA-101). D. For consistency with information presented in Section 9.2.3.2, the magnitude rating will be changed. The text in Section 9.2.3.3 will be amended to read as: "In summary, with the application of mitigation measures, the residual environmental effects on Marine Fish and Fish Habitat resulting from drilling discharges and emissions are predicted to be adverse, ***medium*** ~~low~~ in magnitude, localized, medium to long-term in duration due to recolonization of drill cuttings, occurring regularly during drilling activities, and reversible. This prediction is made with a high level of confidence." E. See response to IR-32/Conformity DFO-1. F. See response to IR-101/Conformity DFO-3 regarding the applicability of mitigations to the various project activities. For clarity for the reviewer, mitigations listed in Section 9.2.5.1 which will be implemented, as applicable, to reduce potential impacts to benthic habitat include: avoiding *Lophelia pertusa* corals, using a cuttings transport system, chemical screening, fish habitat compensation, and treating discharges in accordance with regulatory requirements. G. As detailed in Section 9.2.3.2 and explained in the response to IR-109/CEAA-37 the EIS considers a variety of information sources to inform the effects assessment of drill cuttings discharge on Marine Fish and Fish Habitat, including the EEM programs for the existing production operations (e.g., Hibernia, Terra Nova and White Rose), scientific literature (e.g., Gates et al. 2017, Cordes et al. 2016) and site-specific modelling (Appendix I of the EIS). These studies provide information on environmental effects from drill cuttings on the physical and biological environments. While there may be variations in overall

	deposition area depending on local oceanographic processes, substrate composition, the effects on the environment are similar across worldwide drilling projects (Gates et al. 2017, Cordes et al. 2016). Therefore, existing information (refer to IR 143/ECCC-24) from the North Atlantic and other regions were used to inform the effects assessment and are relevant to the BdN Project. H. See response to IR-126/CEAA-56. The potential effects of drill cuttings deposition are presented in Section 9.2.3.2 indicating recolonization by some pioneer species in as little as a year (930 m depth) and increased megafauna diversity and densities after 10 years (595-640 m depth) (Gates et al. 2017). Considering the range in potential recovery in various species including corals and sponges, the duration of effects may be between 1-5 years for some species and 5 years for others. Therefore, the duration range of medium to long term is appropriate. I. See response IR-226/DFO-110. References: Cordes, E.E., D.O.B. Jones, T.A. Schlacher, D.J. Amon, A.F. Bernardino, S. Brooke, R. Carney, D.M. DeLeo, K.M. Dunlop, E.G. Escobar-Briones, A.R. Gates, L. Génio, J. Gobin, L. Henry, S. Herrera, S. Hoyt, M. Joye, S. Kark, N.C. Mestre, A. Metaxas, S. Pfeifer, A.K. Sweetman, and U. Witte. 2016. Environmental impacts of the deep-water oil and gas industry: A review to guide management strategies. Frontiers in Environmental Science, 4: 1-26. Gates, A.R., M.C. Benfield, D.J. Booth, A.M. Fowler, D. Skropeta, and D.O.B. Jones. 2017. Deep-sea observations at hydrocarbon drilling locations: contributions from the SERPENT Project after 120 field visits. Deep-Sea Research Part II: Topical Studies in Oceanography, 137: 463-479.

IR-129 **DFO-85**	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 9.2.5.1
Context/Rationale	In Section 9.2.5.1 of the EIS, Christian et al. (2003) is mentioned, but the results that substantial difference in embryonic development rate were observed are not presented. This information provides potential effects of seismic sound on snow crab.	
Request **15-Apr-19**	Describe the "substantial difference in embryonic development rate" observed in the indicated study, including direction and incorporate the findings in order to substantiate the effects analysis.	
Equinor Response **15-Nov-19**	The Christian et al. (2003) study component investigated differences in development between 2,000+ fertilized eggs exposed to seismic sound (treatment) and 2000+ fertilized eggs not exposed to seismic sound (control) at 12 weeks post-exposure. Significant differences were found between the two groups in terms of both mortality rate ($p=0.034$) and development rate (<0.001 to 0.002), with exposed fertilized eggs showing a higher mortality rate and a lower development rate. For clarity, the text in section 9.2.5.1 will be amended to read as: ~~"While a substantial difference in embryonic development rate was observed between the exposed and control eggs,~~ ***Significant differences were found between the two groups in terms of both mortality rate (p=0.034) and development rate (<0.001 to 0.002), with exposed fertilized eggs showing a higher mortality rate and a lower development rate. However,*** it should be noted	

	that both egg masses came from a single female crab and any measure of natural variability was unattainable.”

IR-130	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 9.2.5.1
DFO-146		
Context/Rationale	In Section 9.2.5.1 of the EIS, it is not clear why 160 dB re 1 µPa (0-p) was selected as a behavioural effects threshold for fish with swim bladders.	
Request 15-Apr-19	Provide the rationale for selection of behavioural effects threshold 160 dB re 1 µPa $_{(0\text{-}p)}$ for finfish.	
Equinor Response 15-Nov-19	As indicated in Section 9.2.5.1 of the EIS, 160 dB re 1 µPa (0-p) was selected as the behavioural effects threshold for fish with swim bladders based on the literature review provided in the “Behavioural Effects” subsection of this section. As stated in 9.2.5.1-Sound Modelling “Given the substantial variability in behaviour effect sound level thresholds between and within fish species (see literature review provided earlier in this section), 160 dB re 1 µPa (0-p) is a sensible choice as the minimum peak SPL that could cause behavioural effects on fish with swim bladders.” The point of variability both within and between species was discussed, indicating that behavioural effects thresholds vary considerably. The threshold level selected has been documented to cause more overt behavioural responses (i.e., movement away from the area) in some cases for fishes with swim bladders and is therefore more conservative. For instance, it is stated in Section 9.2.5.1- Behaviour effects “Pearson et al. (1992) concluded that received SPL thresholds for overt rockfish behavioral response and more subtle rockfish behavioral response are 180 dB re 1 µPa0-p and 161 dB re 1 µPa0-p, respectively. For clarity, the text in Section 6.1.5.2-Sound Modelling will be revised to read as: “Given the substantial variability in behaviour effect sound level thresholds between and within fish species ***(see literature review provided in Section 9.2.5.1-Behavioural Effects***), 160 dB re 1 µPa (0-p) is a sensible choice as the minimum peak SPL that could cause behavioural effects on fish with swim bladders.”	

IR-131	Guideline Ref:	**EIS Ref:** Section 9.2.5.1
CEAA-63		
Context/Rationale	In Section 9.2.5.1 of the EIS, the seismic surveys appear as a single point source. This location is more relevant for the VSP, but not for the wider ranging 4D surveys. An explanation of the areas of ensonification of fish habitat from the various geophysical surveys are required to understand the zones of influence and the rationale used in the effects analyses. This information is necessary to understand the effects ratings of detectable changes that are within or beyond natural variability to fish, sea turtles, special areas, marine mammals, species at risk and commercial fishing.	
Request 15-Apr-19	Provide the anticipated 4D seismic survey areas in the Core BdN Development and Project Areas and a graphic of the zone of influence for PTT, TTS and behavioural effects on fish to illustrate the potential area of ensonification of fish habitat, marine mammal habitat, and sea turtle habitat.	

Equinor Response 15-Nov-19	See response to IR-11/CEAA-5 Part B regarding the zone of influence for sound from all Project vessels and activities, including 4D-seismic. The zone of influence for each VC is illustrated on Figure 4-1. See response to IR-17/C-NLOPB-5 regarding 4D seismic survey area in the Core BdN Development Area. Updates to the EIS are not required.

IR-132 **CEAA-66**	Guideline Ref: Section 3.2.8	**EIS Ref:** Section 9.2.6.4
Context/Rationale	Section 3.2.8 of the EIS Guidelines request a preliminary outline of a decommissioning plan for the Project, including the method of plugging and securing the wells, and the disposition of infrastructure. Section 7.2 of the EIS Guidelines requires evaluating the predicted changes to the environment from this project phase. In Section 9.2.6.4 in the EIS, the decommissioning of the FPSO information does not include a timescale to evaluate emissions and discharges from the vessels on site. There is no information on demolition or disposal of any equipment onshore and associated vessel traffic, the number of construction vessels involved, nor addresses NORM in the piping. There is no information about handling of product contained in the subsea structures, how any chemical or oil residues will be removed and dealt within connection with shutdown of the installations. There was no information provided on decommissioning activities including: cleaning, purge criteria, preserving flowlines, abandoned well monitoring, etc.	
Request 15-Apr-19	A. Provide the temporal scale of the FPSO decommissioning. B. Provide a preliminary outline of a decommissioning plan, as required in the EIS Guidelines. C. Assess the effects from decommissioning activities based on zones of influence, information of species (Section 6 in the EIS) that occupy the water column and seafloor habitats of the Core BdN Development Area and Project Area.	
Equinor Response 31-Octo-19	A. As the Project is in the early stages of design, it is not possible to provide a temporal scale of FPSO decommissioning at this time. As stated in Section 2.6.7 of the EIS “At end of field-life, which will either be at the end of the Core BdN Development or Potential Future Development, should it occur, Equinor Canada will decommission the Project in accordance with regulatory requirements in place at the time of decommissioning. It is anticipated that decommissioning will be carried out over multiple seasons.” B. A preliminary description of decommissioning of the FPSO and associated subsea infrastructure is contained in Section 2.6. 7.1. Pursuant to the *Drilling and Production Guidelines* (C-NLOPB 2017), Equinor Canada will develop and submit a decommissioning plan, based upon an approved Development Plan, for C-NLOPB review and approval as end of field life approaches. The Decommissioning and Abandonment Plan must provide a detailed description of a proposed process for removal of “marine installations, structures, pipelines and any associated equipment as well as a consideration of options, environmental protection and safety measures, timelines and estimated costs of decommissioning.” Equinor Canada will comply with all relevant regulatory requirements, including applicable international laws, conventions or agreements in place at the time of the proposed decommissioning.	

	C. See response to IR-100/CEAA-32. An assessment of the potential effects of decommissioning activities, to the extent available, is contained in the various VC chapters based on the zones of influence identified in the EIS. Detailed information on decommissioning, including environmental protection measures, will be included in the Decommissioning and Abandonment Plan (see Part B above). As stated in the *Drilling and Production Guidelines* (C-NLOPB 2017), Equinor Canada will be required to undertake an environmental review (such as an environmental assessment) if the original environmental review does not sufficiently cover the decommissioning and abandonment phase.

IR-133 **CEAA-67**	**Guideline Ref:** Part 2, Section 3.2.8; Section 7.2	**EIS Ref:** Section 9.2.6.4
Context/Rationale	In Section 9.2.6.4 of the EIS, the rationale for positive effects of leaving decommissioned subsea infrastructure on fish habitat was not fully explained to determine if this effect resulted in measureable changes to the benthic ecosystem (magnitude of the benefit). An alternatives means analysis for the fate of subsea infrastructure was not provided. The "mobile opportunistic species" and their ecological value were not identified in this section. It is not clear how mobile opportunistic species are supported for a short time in a temporal context. It is not clear if the species noted in the cited literature apply to the Core BdN Development Area and / or Project Area. This information is needed to understand the effects analysis method rationale and linkages between existing environment data, project activities, and literature reviews and the ratings provided in the concluding statements	
Request **15-Apr-19**	Assess the alternatives of leaving the subsea infrastructure in place or removing.	
Equinor Response **15-Nov-19**	See response to IR-112/DFO-81a; CEAA-41. As stated in Section 9.2.6.2 of the EIS, there are two options for decommissioning of subsea infrastructure – leaving the infrastructure in place or removal of the infrastructure. The potential effects of leaving subsea infrastructure on the seabed would be the same as those discussed for the presence of subsea infrastructure in Section 9.2.2.1 of the EIS. The effects of removal of subsea infrastructure are described in Section 9.2.6.2 of the EIS. For clarity the following text will be added to Section 9.2.6.2 of the EIS: "As the Core BdN Development will last 12 to 20 years, subsea infrastructure will likely be colonized by sessile invertebrates. ***As discussed in Section 9.2.2.1, the presence of subsea infrastructure may provide new habitat for benthic species colonization as well as the attraction of fish due to increase in food and habitat subsidization. These positive effects would continue should subsea infrastructure remain in place."***	

IR-134 DFO-85	Guideline Ref: Part 2, Section 7.3.6	EIS Ref: Section 9.4, Table 9.13
Context/Rationale	In Table 9.13 in Section 9.4 of the EIS, the only potential for a direct interaction between Atlantic Salmon and the proposed activity would be during the at–sea migration. However, the table suggests the impact may be on eggs and fry (larvae?). The indirect effect of less eggs and fry due to fewer adults returning is possible; however, the table should reflect the focus of the text, which was direct impacts.	
Request **15-Apr-19**	Update Table 9.13 in Section 9.4 of the EIS and elsewhere in the EIS, as appropriate, to accurately identify the life cycle phases of Atlantic salmon that may interact directly and indirectly with the Project activities.	
Equinor Response **15-Nov-19**	As noted in Table 9.13, no interaction is predicted for the freshwater species Atlantic salmon (eggs and larvae) and American eel (Juveniles/Adults). As discussed in Table 9.14, no direct interaction is predicted for these life phases as they are in freshwater. Table 9.13 will be amended as follows: **Table 9.13 Marine Fish Species at Risk: Potential Interactions with Project Components by Life History Stage**	

Eggs	Larvae	Juveniles / Adults	Project Component Potential Interaction
~~**Freshwater Species**~~			
~~Atlantic salmon~~	~~Atlantic salmon~~	~~American eel~~	~~No interaction~~

IR-135 CEAA-70	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 9.4.1
Context/Rationale	In Section 9.4.1 of the EIS, the potential environmental effects on three wolffish species as described in the DFO reference is not provided. An understanding of the interactions, pathways of effects and potential threats, is needed. Figures 9-6 and 9-7 in the EIS show only Canadian RV surveys; however, the Core BdN Development Area lies within Northwest Atlantic Fisheries Organization areas dominated by international fishers.	
Request **15-Apr-19**	A. In Section 9.4.1 of the EIS describe and discuss the potential effects on all wolffish species found in the Core BdN Development Area and Project Area B. Provide a rationale for how these effects will be localized and minor from project effects using the effects descriptors for consistency in ratings. C. Explain how the specific mitigation measures will reduce adverse interactions with wolffish. D. Describe any lack of data, as applicable.	
Equinor Response **15-Nov-19**	A/C Chapter 9 assesses the potential effects of Project activities on Marine Fish and Fish Habitat and includes consideration of relevant fish species (both secure and at risk). A summary of potential interactions of wolffish species with Project Activities is presented in Table 9.13 (Marine Fish Species at Risk: Potential Interactions with Project Components by Life History Stage) and Table 9.14 (Marine Fish Species at Risk: Analysis of Potential Environmental Interactions and Effects).	

	As indicated in response to IR-101/Conformity DFO-3, mitigation measures will be identified for each activity. Mitigation measures for this VC apply to both secure and at-risk species including Atlantic, spotted, and northern wolffish. These mitigation measures minimize potential benthic effects (e.g., project planning and design) and water quality effects from discharges (e.g., waste treatment guidelines) and thereby reduce potential effects on marine fish including wolffish species. This EIS is consistent with the proposed "Recovery Strategy for Northern Wolffish (*Anarhichas denticulatus*) and Spotted Wolffish (*Anarhichas minor*), and Management Plan for Atlantic Wolffish (*Anarhichas lupus*) in Canada" that note that the "potential effects on wolffish would be highly localized and insignificant to the population as a whole" (DFO 2018). The Project Area is also outside proposed critical habitat for northern and spotted wolffish reducing potential interactions with areas proposed to be necessary for the survival and recovery of the listed species. B. See responses to IR-13/CEAA-6; DFO-1 and IR-34/CEAA-22 regarding localized effects. D. EIS conclusions are evidence based using all available information as described in Section 4.3.3. Uncertainties associated with predictions are noted in the EIS. The EIS is complete and updates are not required.

IR-136 **CEAA-71**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 9.4.2
Context/Rationale	In Section 9.4.2 of the EIS, thorny skate distribution is illustrated using only Canadian RV survey data and thus biased. This species occurs outside of the EEZ. It is important to confirm the presence of this species at risk and its potential interactions to all project activities that lie outside of the EEZ.	
Request **15-Apr-19**	A. Describe relevant NAFO database information on thorny skate distribution and update the EIS accordingly. B. Identify the data and or knowledge gaps, where appropriate.	
Equinor Response **15-Nov-19**	Thorny skate was noted to be potentially present within the Project Area and assessed in Section 9.4 of the EIS. Canadian RV surveys are sufficient for determining presence of a demersal fish such as thorny skate. NAFO datasets were not available for mapping distributions from the Spanish trawl surveys (Román et al 2018). However, summary reports indicate presence of thorny skate along the shelf and slopes within the Project Area similar to the Canadian RV data. The Ocean Biogeographic Information (OBIS) dataset indicates presence of thorny skate on the shelf and slopes of the Grand Banks and the Flemish Cap with few observations in the Flemish Pass (OBIS 2019). Available datasets indicate the potential presence of thorny skate in the Project Area and therefore the species was assessed as part of Marine Fish and Fish Habitat VC. Inclusion of NAFO data would not alter the effects predictions. The information presented in the EIS and EA methodology used are consistent with other offshore environmental assessments and is sufficient for assessment purposes. Updates to the EIS are not required. References: Román, E., González-Troncoso, D., and M. Alvarez. 2018. Results for the Atlantic cod, roughhead grenadier, redfish, thorny skate and black dogfish of the Spanish Survey in the	

	NAFO Div. 3L for the period 2003-2017. Northwest Atlantic Fisheries Organization Scientific Council Research Document. 18/018. Serial No. N6802. OBIS; Ocean Biogeographic Information System. 2019. *Amblyraja radiata* (Donovan, 1808). Available from: https://obis.org/taxon/105865.

IR-137 **CEAA-72**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 9.4.3; Section 9.4.4
Context/Rationale	In Sections 9.4.3 and 9.4.4 of the EIS, the effects rating for Atlantic cod and white hake is not consistent with the effects rating for marine fish and fish habitat. The project related disturbances are not specified, the zones of influence (affected areas) are not described or shown, and mitigation measures are non-specific. Based on foodwebs in the Project areas, no explanation is provided if the avoidance of Atlantic cod from the affected area affects biotic interactions.	
Request **15-Apr-19**	In Sections 9.4.3 and 9.4.4 of the EIS review the effects rating for marine fish and fish habitat at risk using the modeled zones of influence, and ecological information in Section 6 of the EIS, and update the EIS.	
Equinor Response **15-Nov-19**	The assessment of species at risk, within the relevant VC chapter, considers the Project activities-SAR interactions as outlined in Table 9.14, mitigation measures outlined (see IR-101/Conformity DFO-1 for clarity), species biology and spatial distributions as described in Section 6.1.9, and the effects assessment conclusions on secure species. The effects assessment does not repeat all of the information presented in the effects assessment sections for the secure species (i.e., zones of influence) rather uses that information to provide the effects assessment for each SAR for which there may be interactions with the Project. As Atlantic cod and white hake are mobile and the Project Area is an area of low aggregation for these species as outlined in Table 9.14, Project effects on its biotic interactions would be low. Sections 9.4.3 and 9.4.4 will be amended to read as: <u>Section 9.4.3</u> "***As Atlantic cod is mobile and the Project Area is an area of low aggregation for this species as outlined in Table 9.14, Project effects on its biotic interactions would be low.*** As predicted, ***while*** Project-related disturbances are ***relatively*** localized and ***long-term***, mitigation ***measures*** will be implemented to avoid or reduce potential effects; therefore, there is limited potential for interaction with these species.: <u>Section 9.4.4</u> "***As white hake is mobile and the Project Area is an area of low aggregation for this species as outlined in Table 9.14, Project effects on its biotic interactions would be low.*** As predicted, ***while*** Project-related disturbances are ***relatively*** localized and ***long-term***, mitigation ***measures*** will be implemented to avoid or reduce potential effects; therefore, there is limited potential for interaction with these species."	

IR-138 **DFO-161**	**Guideline Ref:** Part 2, Section 7.1.3	**EIS Ref:** Section 9.4.5
Context/Rationale	In Section 7.1.3 of the EIS, catch data have been used to suggest that salmon do not overwinter in the Flemish Pass area. Catch data are useful for indicating fish presence,	

	but do not necessarily infer absence. Uncertainty associated with overwintering patterns should be incorporated into Section 9.4.5.
Request 15-Apr-19	In Section 9.4.5 of the EIS revise the effects analysis on Atlantic salmon to reflect the catch data methods (equipment, seasonality, effectiveness, etc.) and results.
Equinor Response 2-May-19	Equinor Canada provided the following response to this IR in May 2019. *This is addressed in the EIS with statements such as "Given the available data, there is likely low interaction with spring migration of adults within and near the Project Area."*
DFO Response 10-Jun-19	Response is adequate, with the understanding that this approach is taken throughout the EIS.
Equinor Response 15-Nov-19	The information presented in Section 7.1.3 of the EIS relates to commercial groundfish harvesting catch data and does not include any commercial catch data for Atlantic salmon. However, the research vessel catches of Atlantic salmon in the northwest Atlantic (1965-1985) were provided in Figure 6-41 (Section 6.1.9.6). It should be noted that this figure had an error in the EIS and is revised below. This information was a portion of that used to provide descriptions of habitat use by each salmon population as outlined by COSEWIC (2010) (see Sections 6.1.9.6 and 9.4.5 of the EIS). Data used on assessments of overwintering included satellite telemetry (e.g., Lacroix 2013), genetic studies by DFO (e.g., Bradbury et al. 2015; 2016 as well as reports indicating no overwintering confirmed in the Grand Banks area (e.g., Reddin and Shearer 1987, Reddin and Friedland 1993, Reddin 2006, Sheehan et al. 2012). As such, the existing statements regarding Atlantic salmon presence in the EIS as noted above in the May-15 Response "Given the available data, there is likely low interaction with spring migration of adults within and near the Project Area." remain valid. Figure 6-42 will be replaced. The revised figure can be found in response to IR-96/DFO-28. References: Bradbury, I.R., L.C. Hamilton, S. Rafferty, D. Meerburg, R. Poole, J.B. Dempson, M.J. Robertson, D.G. Reddin, V. Bourret. M. Dionne, G. Chaput, T.F. Sheehan, T.L. King, J.R. Candy, and L. Bernatchez. 2015. Genetic evidence of local exploitation of Atlantic salmon in a coastal subsistence fishery in Northwest Atlantic. Can. J. Fish. Aquat. Sci. 72:83-95. Dx.doi.org/10.1139/cjfas-2014-0058. Bradbury, I.R., L.C. Hamilton, G. Chaput, M.J. Robertson, H. Goraguer, A. Walsh, V. Morris, D. Reddin, J.B. Dempson, T.F. Sheehan, T.L. King, and L. Bernatchez. 2016. Genetic mixed stock analysis of an interceptor Atlantic salmon fishery in the Northwest Atlantic. Fisheries Research 174:234-244. Dx.doi.org/10.1016/fishres.2015.10.009. COSEWIC. 2010. COSEWIC assessment and status report on the Atlantic Salmon *Salmo salar* (Nunavik population, Labrador population, Northeast Newfoundland population, South Newfoundland population, Southwest Newfoundland population, Northwest Newfoundland population, Quebec Eastern North Shore population, Quebec Western North Shore population, Anticosti Island population, Inner St. Lawrence population, Lake Ontario population, Gaspé-Southern Gulf of St. Lawrence population, Eastern Cape Breton population, Nova Scotia Southern Upland population, Inner Bay of Fundy population, Outer Bay of Fundy population) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON, xlvii + 136 pp.

	Lacroix, G.L. 2013. Population-specific ranges of oceanic migration for adult Atlantic salmon (*Salmo salar*) documented using pop-up satellite archival tags. Can. J. Fish. Aquat. Sci. 70:1011-1030. Dx.doi.org/10.1139/cjfas-2013-0038. Reddin, D.G., and W.M. Shearer. 1987. Sea-Surface Temperature and Distribution of Atlantic salmon in the Northwest Atlantic Ocean. American Fisheries Society Symposium I: 262-275. Reddin, D.G. and K.D. Friedland. 1993. Marine environmental factors influencing the movement and survival of Atlantic salmon. Pages 79-103 in: [D. Mills editor] Salmon in the Sea and New Enhancement Strategies. Atlantic Salmon Federation, Fishing New Books/Blackwell Publishing, Ontario. Reddin, D.G. 2006. Perspectives on the marine ecology of Atlantic salmon (*Salmo salar*) in the Northwest Atlantic. Canadian Science Advisory Secretariat Research Document 2006/018, Fisheries and Oceans Canada, Science. Available online: http://www.dfo-mpo-gc.ca/csas Sheehan, T.F., D.G. Reddin, G. Chaput, and M.D. Renkawitz. 2012. SALSEA North America: a pelagic ecosystem survey targeting Atlantic salmon in the Northwest Atlantic. ICES Journal of Marine Science 69(9): 1580-1588. Doi:10.1093/icesjms/fss052

IR-139 **CEAA-73**	**Guideline Ref:** Part 2, Section 7.2; Section 7.3	**EIS Ref:** Section 9.4.5
Context/Rationale	In Section 9.4.5 of the EIS, potential interactions between the Project activities and Atlantic salmon are noted as being reduced by localized and short-term nature of project activities. However, the EIS describes the zones of influence of various project emissions and discharges as extending well beyond the immediate vicinity of the activities and the project schedule is longer than 12 months. This conclusion is not consistent with project activity schedule and effects rating descriptors.	
Request **15-Apr-19**	In Section 9.4.5 of the EIS review the effect ratings in the analysis for consistency with the project activities schedule and zones of influence and revise accordingly.	
Equinor Response **15-Nov-19**	See responses to IR-13/CEAA-6; DFO-1 and IR-34/CEAA-22 regarding localized effects. For clarity the text in Section 9.4.5 will be modified to read as: <u>Insular Newfoundland Populations</u> "Given the available data, there is likely low interaction with spring migration of adults within and near the Project Area. ***While Project activities are relatively long-term***, potential interactions with the Project are ~~also~~ reduced by the localized ~~and short-term~~ nature of activities, planned mitigation measures to avoid or reduce potential effects, lack of Project interactions with critical habitats, and the highly mobile nature of the species." <u>Gulf of St. Lawrence Populations</u> "Given the available data, there is a low potential for spring migration of adults to interact with the Project Area. ***While Project activities are relatively long-term***, potential interactions with the Project are ~~also~~ reduced by the localized ~~and short-term~~ nature of activities, planned mitigation to avoid or reduce potential effects, lack of Project interactions with critical habitats, and the highly mobile nature of the species."	

	Eastern-Southern Nova Scotia and Outer Bay of Fundy Populations "Given the available data, there is a low potential for spring migration of adults to interact with the Project Area. ***While Project activities are relatively long-term***, potential interactions with the Project are ~~also~~ reduced by the localized ~~and short-term~~ nature ~~-~~of activities, planned mitigation to avoid or reduce potential effects, lack of Project interactions with critical habitats, and the highly mobile nature of the species."

IR-140 **CEAA**	**Guideline Ref:** Part 2, Section 7.2, Section 7.3	**EIS Ref:** Section 9.4.7
Context/Rationale	In Section 9.4.7 of the EIS, the effects analysis on redfish is incomplete in not taking the ecological information and overlaying with the many project zones of influence in the various phases or many potential disturbances. The EIS states that critical habitat has not been established, but corals are known to be important to redfish survival. The EIS refers generically to fish avoidance from sound disturbance by referring to Popper and Hastings. However project relevant information was not provided if the two redfish species may be exposed to the various project sound emissions. Project-related mitigation that will be implemented to reduce potential effects on redfish are not identified. Reference is made to regional population effects from the project which is not suitable for evaluating potential effects from the routine activities within the Core BdN Development Area or Project Area where specific stocks are found. Section 7.2 of the EIS Guidelines required an assessment of changes to the environment from the project. Section 7.3 of the EIS Guidelines required an assessment of fish and fish habitat. A complete effects analysis on redfish species at risk is needed to understand the environmental effects on this ecological and economical important finfish species from the project in the appropriate affected area.	
Request **15-Apr-19**	In Section 9.4.7 provide a complete effects analysis of the project on redfish species at risk as per the EIS Guidelines using zones of influence from Project emissions and discharges and important areas.	
Equinor Response **15-Nov-19**	The biological information and associated distributions of redfish species (Acadian, golden, deepwater) are described in Sections 6.1.8. and 6.1.9 of the EIS. The distribution of redfish species was taken from Canadian RV surveys (Figure 6-25 and Figure 6-26) and surveys on the Flemish Cap (Figure 6-27 to Figure 6-29) in relation to the Project Area. The description of potential effects of Project Activities on Marine Fish and Fish Habitat includes consideration of relevant fish species (both secure and at-risk) (as stated in Section 9.0). Sections 9.2 and 9.3 of the EIS provide the effects assessment for Project activities on Marine Fish and Fish Habitat, which, as described in Section 9.1, includes the consideration of both secure and at-risk species. A summary of potential interactions of redfish species with Project Activities by Project Component and life history stages is presented in Table 9.13 and Table 9.14. Section 9.4.7 assesses Project activities on redfish, which considers the effects assessment as presented in Sections 9.2 and 9.3. Section 9.1.5.2 presents mitigation measures for this VC by Project activity (see response to IR-101/Conformity DFO-3), which apply equally to both secure and at-risk species including redfish species. In summary, potential interactions with the Project and these species are reduced by the planned mitigation measures to avoid or reduce potential effects, lack of Project interactions with critical habitats, and the mobile nature of the	

	species. The information and methodology in the EIS are consistent with other offshore environmental assessments and is sufficient for assessment purposes. For clarity, Section 9.4.- Redfish Species will be amended to read as: "Although there is potential for interaction with these species, areas of relatively high aggregation on the slopes outside the Project Area limits potential regional population effects on these species. ***In summary, potential interactions with the Project and redfish species are reduced by the planned mitigation measures to avoid or reduce potential effects, lack of Project interactions with critical habitats, and the mobile nature of the species.*** ~~Project-related mitigation will be implemented to reduce potential effects, and there is no designated critical habitat that will reduce potential effects on this species.~~ "

IR-141 **CEAA-74**	**Guideline Ref:** Part 2, Section 7.1.3, Section 7.31.5	**EIS Ref:** Section 9.4.8
Context/Rationale	In Section 9.4.8 of the EIS the presence of sharks and blue tuna are noted to occur in the project area, primarily for feeding excursions. The EIS also states that these species only migrate through the area. It is unclear if all species at risk sharks and tuna listed occur within the zone of influence of the two Project Areas.	
Request **15-Apr-19**	Clarify if sufficient data are available to make a determination of project effects upon sharks and tuna species at risk.	
Equinor Response **15-Nov-19**	Distributional patterns and biological information on sharks and tuna at-risk species are presented in Sections 6.1.9.3 (White shark), 6.1.9.4 (Basking shark, Shortfin Mako, Porbeagle) and 6.1.9.7 (Atlantic bluefin tuna). As stated in Section 6.1.9, Atlantic bluefin tuna, basking shark, porbeagle and shortfin mako have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and white shark is listed as a Schedule 1 *Species at Risk Act* listed species. Information related to potential interactions of these species with Project activities is presented in Table 9.14. While these species may not be specifically observed within the Project Area (OBIS 2019, Ocearch 2019), nearby observations combined with the high mobility or migratory nature of these species suggests that they may travel through the Project Area (See Sections 6.1.9 and 9.4.8 of the EIS). As discussed in Sections 6.1.9 and 9.4.8, based on available information presented in the EIS regarding life history, migratory patterns, and observations in the Northwest Atlantic, there is sufficient information for assessing the potential effects of the Project on Atlantic bluefin tuna, white shark, basking shark, porbeagle, and shortfin mako. For clarification, the text in Section 6.1.8.3 will be amended to read as: "During their northern migrations, sharks, tuna, and swordfish species typically remain in areas under the influence of the Gulf Stream (Walli et al. 2009; Vandeperre et al. 2014), and therefore would be expected to be at relatively low abundance in the Project Area, which is principally exposed to the Labrador Current (see Section 5.4.2). ***While these species may not be specifically observed within the Project Area (OBIS 2019, Ocearch 2019), nearby observations combined with the high mobility or migratory nature of these species suggests that they may travel through the Project Area.***"	

	The additional information does not change the effects assessment and the EIS conclusions remain valid. References: ***OBIS (Ocean Biogeographic Information System). 2019. Ocean Biogeographic Information System. Available from https://obis.org.*** ***Ocearch. 2019. Shark Tracker. Available from https://www.ocearch.org/***

IR-142	**Guideline Ref:** Part 2, Section 7.3.6	**EIS Ref:** Section 9.4, Table 9.13
DFO-34		
Context/Rationale	The presence of Atlantic Bluefin Tuna (eggs, larvae - pelagic), American Eel (eggs - pelagic), Acadian Redfish (juveniles/adults – demersal) and Deepwater Redfish (juveniles/adults – demersal) in Table 9.13 is inconsistent with information in Table 9.14.	
Request **15-Apr-19**	Update Tables 9.13 and 9.14 in Section 9.4 of the EIS to be consistent in listing finfish species, as appropriate.	
Equinor Response **15-Nov-19**	Upon review of the information provided in Table 9.13, Table 9.14 and the text in Section 9.4, the following edits will be made to "Tables 9.13 and Table 9.14" to ensure consistency in the information presented.	

Table 9.13 Marine Fish Species at Risk: Potential Interactions with Project Components by Life History Stage

Eggs	Larvae	Juveniles / Adults	Project Component Potential Interaction
Marine – Pelagic Species			
~~American eel~~ ~~Atlantic bluefin tuna~~ Atlantic cod Roughhead grenadier Roundnose grenadier White hake	Acadian redfish American eel ~~Atlantic bluefin tuna~~ Atlantic cod Deepwater redfish Northern wolffish Roughhead grenadier Roundnose grenadier Spotted wolffish Striped wolffish White hake	Acadian redfish American eel Atlantic bluefin tuna Atlantic salmon Basking shark Deepwater redfish Porbeagle Shortfin mako White shark	Offshore Construction and Installation and HUC Production and Maintenance Operations Drilling Activities Supply and Servicing Supporting Surveys Decommissioning

The following edits will be made to Table 9.14

Acadian redfish (Atlantic population)

- "Potential life stage interactions include larvae (pelagic), and juveniles/adults (***demersal*** / pelagic)"

Deepwater redfish (Northern Population)

- "Potential life stage interactions include larvae (pelagic), and juveniles/adults (***demersal*** / pelagic)"

IR-143 **ECCC-24**	**Guideline Ref:** Part 2, Section 7.5	**EIS Ref:** Section 9.5, Table 9.15
Context/Rationale	In Section 9.5 of the EIS, the certainty in predictions, as outlined in the Key of Table 9.15, is categorized as low level of confidence, moderate level of confidence, or high level of confidence, however, it is not apparent how the different levels of confidence were determined. Clarity is required to understand the linkage between data gaps and effects ratings.	
Request **15-Apr-19**	Explain how the certainty in predictions was determined.	
Equinor Response **2-May-19**	Equinor Canada provided the following response to this IR in May 2019. *Confidence (or certainty) in predictions is defined in EIS Section 4.3.3, Table 4.3. Confidence is based on the knowledge of existing conditions, modelling of effects, and/or effectiveness of mitigations. The approach and methods are consistent with other recent industry environmental assessments.*	
ECCC Response **10-Jun-19**	Based on the definitions in Section 4.3.3., a high degree of certainty in effects predictions indicates robust knowledge. However, conclusions were based on data from the Flemish Pass, EEM data, and international experience. ECCC is not sure that this represents robust knowledge given the lack of site-specific data and as such are not sure if the information would be considered sufficient to conclude there is a high degree of certainty for the predictions of interest (for us it would be those elements related to water quality). The document could be more clear in terms of what resources/ data were used to make decisions (e.g. in text citations). At the workshop the proponent suggested that they would be more explicit about justification and level of certainty for determining effects, there should be at least some attempt to do that.	
Equinor Response **15-Nov-19**	Confidence or certainty predictions are based on applicability and availability of data. For instance, Section 9.5.2 of the EIS states "*Given the variable nature of the data on seismic effects, a moderate level of confidence was prescribed to its effects determination.*" As stated in response to IR-102/CEAA-33 "EIS conclusions are evidence based, using all available information as described in Section 4.3.3. Uncertainties associated with predictions are noted in the EIS." Part 1, Section 4.2.3 of the EIS Guidelines state that "In preparing the EIS, the proponent is encouraged to make use of existing information relevant to the project, such as the Eastern Newfoundland Strategic Environmental Assessment. When relying on existing information to meet requirements of the EIS Guidelines, the proponent will either include the information directly in the EIS or clearly direct the reader to where it may obtain the information (i.e. through cross-referencing). When relying on existing information, the proponent will also comment on how the data were applied to the project, separate factual lines of evidence from inference, and state any limitations on the inferences or conclusions that can be drawn from the existing information. In such circumstances, the proponent will clearly describe potential or known data or knowledge gaps and uncertainties and describe how these have been addressed in the assessment of the project." Furthermore, Part 1, Section 4.3 of the EIS Guidelines states "The proponent will consider the use of both primary and secondary sources of information regarding baseline information, changes to the environment and the corresponding effect on health, socio-	

	economics, physical and cultural heritage and the current use of lands and resources for traditional purposes." This guidance was applied to the effects assessment for each VC. Information from existing NL EEM programs representing decades of effects monitoring data and multiple wells, along with international effects monitoring data (e.g., IOGP) representing decades of data, previous environmental assessments, international reports and scientific studies were used throughout the EIS to provide an overview of potential effects. Together, these data present a comprehensive overview of potential effects of drilling and production on the marine environment on which the effects assessment is based, including confidence in predictions. This is the same approach used in previous environmental assessments for offshore development projects, most recently the Hebron Project and the White Rose Extension Project. Assumptions and/or limitations of the data from these reports were identified. Clarification on levels of confidence for various VCs, as requested through multiple information requests can be found in the responses to the following IRs: IR-37/CEAA-111; IR-128/DFO-20; CEAA-61; IR-143/ECCC-24; IR-144/DFO-21,109,145,150,153,162; IR-157/DFO-94; IR-172/CEAA-86; IR-182/ECCC-33.

IR-144 **DFO-21, DFO-109 DFO-145, DFO-150 DFO-153, DFO-162**	**Guideline Ref:** Part 2, Section 7.3.3; Section 7.3.4; Section 7.3.8.3; Section 7.6.3	**EIS Ref:** Section 9.2.2.2; Section 9.2.3.2; Section 9.5.2; Table 9.15, Table 9.16; Section 11.2.3.1; Section 12.4.2; Table 12.8; Section 12.2.5.3; Table 12.3; Section 12.2.6.2; Section 15.2.3; Table 15.5
Context/Rationale	In Section 9.5.2 of the EIS, inconsistencies are noted throughout Section 9.0 of the EIS. Some differences are noted between Table 9.15 and other portions of Section 9.0. For example, description of potential behavioural effects resulting from produced water and other waste discharges are not described in Section 9.2.2.2, yet this potential effect is noted in Table 9.6. While Page 9-44 of the EIS states "Potential effects of waste discharges from the drilling installation would be the same as assessed for HUC (Section 9.2.1.2) and production and maintenance operations (Section 9.2.2.2)", Table 9.6 indicates two potential effects for other waste discharges under Drilling Activities, while all potential effects are selected for Marine Discharges under HUC Activities. There is no discussion regarding potential effects from towed equipment, although potential effects are noted for this activity in Table 9.6. There are inconsistencies between the text on Page 9-54 and Table 9.4 with respect to the relative risk criteria ratings. Section 11.2.3.1 of the EIS states that "Results of the assessment presented in Chapter 9 suggest that effects from presence and operation of the drilling installation is negligible", is inconsistent with Table 9.15, which shows a low magnitude effect. There are some inconsistencies in Section 12.0 of the EIS between Table 12.8 and effects analysis sections by project phase. For example, certainty for Geophysical Activities is Medium and High in Table 12.8, but a moderate level of confidence is noted on Page 12-28. Also, potential effects from well decommissioning are not described in Section 12.2.6.2, but potential effects are noted in Table 12.3.	

	Table 15.5 in Section 15.2.3 of the EIS has some inconsistencies with other portions of the EIS. Potential effects listed for marine vessel traffic in Table 15.5 is not consistent with effects listed for supply and servicing in Table 9.15. Other harvesting activity is noted as potentially affecting marine fish and fish habitat in Table 15.4, but this interaction is not described in Table 15.5.
Request 15-Apr-19	Ensure consistency between all tables that identify project interactions and potential effects, the effects analysis text and summary tables throughout the EIS for all VCs, between VCs and all project activities.
Equinor Response 15-Nov-19	To address the general issue respecting the rationale for selection of potential effects in the various VC chapters in the EIS as identified in this information request and in IRs-37/CEAA-111, 149/DFO-144b, IR-151/DFO-91, IR-198/DFO-144c, IR-199/DFO-98, and IR-204/CEAA-91, Section 4.3.2 will be amended to read as: "In order to identify and focus on key environmental issues and interactions in the EIS, the effects assessment initially identifies the various questions and issues that have been raised with regard to the Project and its potential effects on each VC. This includes those issues that have been referenced in the EIS Guidelines, through Equinor Canada's regulatory, Indigenous, and stakeholder engagement activities (as outlined in Chapter 3). ***The potential environmental effects of project activities and components were identified and scoped using generally accepted methodology. In accordance with Part 2, Section 3.2 of the EIS Guidelines, the effects assessment of project activities has been based on those discharges/activities "with the greatest potential to have environmental effects." Scoping of Project – VC interactions is an approach which is consistent with standard, accepted EA methodology and in alignment with the underlying intent of the Agency's Reference Guide: Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects. This approach enables the assessment to be focussed on those Project – VC interactions which are of greatest importance, based on available knowledge, scientific literature, Indigenous knowledge, professional judgement, previous experience (both of Equinor Canada and of other offshore operators) and key issues as identified by Indigenous peoples, stakeholders and the public. Such an approach will facilitate the integration of project planning and design with mitigation and follow-up measures to result in a comprehensive environmental planning process.*** ***In preparing the EIS, Equinor Canada conducted a preliminary, high level assessment of anticipated interactions (pathways) between various project activities and phases and the identified environmental receptors (the VCs). The purpose of this exercise has been to identify interactions of greatest importance and to eliminate analysis of certain potential Project-VC interactions that are known to have no or negligible adverse effects or, in certain instances, those that are already well-regulated or managed under other established processes."*** The environmental effects assessment identifies and focuses on likely environmental interactions between the Project and the VC, and then, on associated Project-induced environmental changes (such as alterations to the physical environment due to Project-related disturbances or emissions) and resulting effects of these changes on the VC. Each VC assessment identifies a number of associated parameters, which are generally defined as an important aspect or characteristic of the VC which, if changed

as a result of the Project, may result in an adverse effect to the VC. For each VC, a summary of these potential interactions and associated parameters will be presented in a table.

An overview of the identified potential interactions between the VC and each of the main Project components and activities is also provided (in table form) to focus and frame the environmental effects assessment. ***The rationale for identifying key potential interactions is provided in the assessment. If a project-VC interaction is omitted from further analysis, a rationale is provided."***

In addition, each VC chapter will be reviewed and, where necessary and appropriate, revised:

- To provide text upfront of interactions tables that explains the rationale for the selection of Project-VC interactions
- To ensure consistency in interactions as between Core BdN Development Project and future development activities
- To provide the rationale for any differences in potential effects in Project activities between interrelated VCs

Necessary revisions to interactions for the specific VC, as applicable, are addressed in the appropriate IR in this response document.

With regard to interactions for Marine Fish and Fish Habitat, as noted by the reviewer are addressed below.

- *For example, description of potential behavioural effects resulting from produced water and other waste discharges are not described in Section 9.2.2.2, yet this potential effect is noted in Table 9.6.*

The text in Section 9.2.2.2 of the EIS will be amended to read as:

"Discharge of higher temperature waters can have potential effects on fish and invertebrate community diversity (Teixeira et al. 2009; Kim et al. 2017) and plankton (Poornima et al. 2005; Lin et al. 2018) injury and mortality as described in Section 9.2.2. ***Effects includes potential avoidance by fishes and invertebrates of areas from changes to water quality."***

- *While Page 9-44 of the EIS states "Potential effects of waste discharges from the drilling installation would be the same as assessed for HUC (Section 9.2.1.2) and production and maintenance operations (Section 9.2.2.2)", Table 9.6 indicates two potential effects for other waste discharges under Drilling Activities, while all potential effects are selected for Marine Discharges under HUC Activities.*

For consistency, Table 9.6 will be amended to read as:

Table 9.6 Potential Project VC Interactions and Associated Effects: Marine Fish and Fish Habitat

Project Component / Activity	Potential Environmental Effects			
	Change in Habitat Availability and Quality	Change in Food Availability and Quality	Change in Fish and Invertebrate Mortality, Injury, Health	Change in Fish and Invertebrate Presence and Abundance (Behavioural Effects)
HUC Activities				
• Marine Discharges	•	•	•	•

	• *There is no discussion regarding potential effects from towed equipment, although potential effects are noted for this activity in Table 9.6.* For clarification, the text in Section 9.2.5.1 of the EIS will be amended to read as: "Although the presence of these vessels ***and towed equipment*** may result in some degree of attraction, avoidance or other behavioural responses by individual fish, there will not likely be any disturbance on a regional level by the Project-related vessel activity due to its transitory nature and thus its short-term presence at any one location. Underwater sound generated by geophysical activities ***with towed or underwater equipment*** has the potential to affect fish and invertebrate species. Other activities, such as environmental and geotechnical / geological surveys and, ROV / AUV may generate some underwater sound, but at much lower levels." • *There are inconsistencies between the text on Page 9-54 and Table 9.4 with respect to the relative risk criteria ratings.* The text on page 9-54 refers to Popper et al. (2014) behavioural effects from seismic sound and corresponds to Table 9.3. Table 9.4 refers to exposure guidelines for shipping and other continuous sounds. For clarification, the text in Section 9.2.5.1 of the EIS will be amended to read as: "In Popper et al. (2014), behavioural effects thresholds for fishes exposed to seismic sound were briefly discussed ***(Table 9.3)***." • *Section 11.2.3.1 of the EIS states that "Results of the assessment presented in Chapter 9 suggest that effects from presence and operation of the drilling installation is negligible", is inconsistent with Table 9.15, which shows a low magnitude effect.* The text in Section 11.2.3.1 of the EIS will be amended to read as: "Results of the assessment presented in Chapter 9 suggest that effects from presence and operation of the drilling installation will be ~~neglible~~ ***low***, and as such, indirect effects on change in food availability or quality for marine mammals and sea turtles are not expected to the degree that would translate into effects on the abundance, distribution, or health of these species." • *There are some inconsistencies in Section 12.0 of the EIS between Table 12.8 and effects analysis sections by project phase. For example, certainty for Geophysical Activities is Medium and High in Table 12.8, but a moderate level of confidence is noted on Page 12-28. Also, potential effects from well decommissioning are not described in Section 12.2.6.2, but potential effects are noted in Table 12.3.* For consistency, the text in Section 12.2.5.3 of the EIS will be amended to read as: "In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from geophysical activities are predicted to be adverse, low to medium in magnitude, within the LSA, short-term in duration, occurring sporadically, and reversible. This prediction is made with a ~~moderate~~ ***medium to high*** level of confidence." Potential effects for wellhead decommissioning have been discussed in other sections of the EIS. For consistency, the text in Section 12.2.6.2 of the EIS will be amended to read as:

"At the end of field life, well template protection and wellheads will likely be removed. Wellhead decommissioning activities are described in Section 2.6.7.2 ***and potential effects on marine fish and fish habitat are described in Section 9.2.6***. Once wellheads are removed, the area is inspected using an ROV to verify that no equipment or obstructions remain in place."

- *Table 15.5 in Section 15.2.3 of the EIS has some inconsistencies with other portions of the EIS. Potential effects listed for marine vessel traffic in Table 15.5 is not consistent with effects listed for supply and servicing in Table 9.15.*

For consistency, Table 15.5 will be amended to read as:

Table 15.5 Marine Fish and Fish Habitat: Other Projects and Activities and their Potential Environmental Effects

Project / Activity	Potential Effects on this VC	Spatial and Temporal Considerations
Marine Vessel Traffic	• ***Change in habitat availability and quality*** • Change in fish and invertebrate mortality, injury, health • Change in fish and invertebrate presence and abundance (behavioural effects)	• Vessels are highly transitory, reducing potential effects in any location and time.

- *Other harvesting activity is noted as potentially affecting marine fish and fish habitat in Table 15.4, but this interaction is not described in Table 15.5.*

For consistency, Table 15.4 will be amended to read as:

Table 15.4 Potential Interactions with Other Projects and Activities Considered in the Cumulative Effects Assessment

Project / Activity	VCs Potentially Affected					
	Marine Fish and Fish Habitat	Marine and Migratory Birds	Marine Mammals and Sea Turtles	Special Area	Commercial Fisheries and Other	Indigenous Peoples
Other Harvesting Activity		•	•		•	•

IR-145 DFO-88	Guideline Ref: Part 2, Section 9.2	EIS Ref: Section 9.6
Context/Rationale	Relevant to Section 9.6 of the EIS, corals and sponges are sessile organisms that can live for decades to centuries, they are not expected to migrate or change. As a result, once surveyed, a site will not need to be revisited unless it is designated as a long-term monitoring site. Long-term monitoring plans need to be developed prior to project commencement and should include sampling of biological material before, during, and after the project	

	concludes. Monitoring Guidelines state coral communities vary from site to site. Hence, a tailor made monitoring program would be relevant for the Canada-NAFO NRA region.
Request 15-Apr-19	In Section 9.6 of the EIS describe long-term monitoring plans for corals and sponges.
Equinor Response 15-Nov-19	See response to IR-146/Conformity ECCC-4; ECCC-25 regarding follow-up monitoring.

IR-146	**Guideline Ref:** Part 2, Section 9	**EIS Ref:** Section 9.6
Conformity ECCC-4 ECCC-25		
Context/Rationale	Non-conformity with EIS Guidelines Section 9.6 of the EIS does not include specific details for the follow-up and monitoring programs listed in the EIS Guidelines. These include (but are not limited to) valued components targeted by the program, list of elements requiring follow-up, planned protocols, analytical methodologies, the number of follow-up studies planned, or a summary of the design and results of monitoring programs for other offshore drilling programs (EIS Guidelines, Part 2, Section 9.1).	
Request 15-Apr-19	Provide an outline for follow-up monitoring based on the EIS zones of influence and verification of effects predictions.	
Equinor Response 15-Nov-19	Equinor Canada does not agree with the assertion of the reviewer respecting the lack of information respecting follow-up and monitoring programs. Each EIS VC chapter for which residual effects are predicted includes text respecting potential follow-up and monitoring programs. In addition, Chapter 18 provides an overview of the general objectives of follow-up and monitoring programs as well as a description of those programs which Equinor has committed to undertake. However, in in the interests of clarification, Equinor Canada will include the following amendments in the EIS: 1. The concluding paragraph of Section 4.3.3 of the EIS will be replaced in its entirety by the following: "***Each VC Chapter also provides a summary, preliminary overview of environmental monitoring and/or follow-up programs that may be required or proposed respecting the VC. As the Project is currently in the planning stages, it is not feasible or possible to set out the particulars of follow-up or environmental observational monitoring programs. Follow-up monitoring will be developed upon finalization of Project design in consultation with the C-NLOPB and relevant government departments (e.g., DFO, ECCC) and through engagement with Indigenous groups and stakeholders, as appropriate. The contents of these programs will be informed by the EA Decision Statement and relevant regulatory requirements. Information respecting proposed follow-up and monitoring programs is set out in Section 18.4 and includes, as applicable and available,*** • ***Rationale and objectives;*** • ***Planning and design;*** • ***Key areas of focus;*** • ***Implementation and schedule;***	

	• ***The format, use and sharing of study results; and*** • ***Evaluation of the results of monitoring programs"*** 2. The Environmental and Monitoring section of each VC chapter for which a follow-up/monitoring program is proposed will be amended by the inclusion of the following language at the end of the applicable Environmental and Monitoring Section: "***More detailed information respecting follow-up and monitoring programs is provided in Section 18.4."*** 3. Section 18.4 of the EIS will be revised to read as: "Equinor Canada will obtain the required permits, approvals, and authorizations for the Project, and Equinor Canada and its contractors will comply with these and relevant regulations and guidelines in planning and implementing the Project. This includes the mitigation measures summarized in the Section 18.2, the implementation of which will be directed, managed, and tracked in accordance with Equinor Canada's existing policies and procedures. ***Monitoring is an important activity for measuring performance against regulatory, corporate and project requirements. Monitoring enables the assessment of progress against goals as well as the gathering of information to track the overall environmental performance throughout the BdN Project. Monitoring falls into two broad categories: compliance monitoring and follow-up monitoring***." 4. Section 18.4.1 will be amended to read as: "Under CEAA 2012, a follow-up program is defined as a program for "verifying the accuracy of the environmental assessment of a designated project" and "determining the effectiveness of mitigation measures". ***It is commonly referred to as environmental effects monitoring (EEM).*** In determining whether a follow-up program is required the following factors should be considered: • Whether the project will impact environmentally sensitive areas / VCs or protected areas or areas under consideration for protection • The nature of Indigenous and public concerns raised about the project • The accuracy of predictions • Whether there is a question about the effectiveness of mitigation measures or the proponent proposes to use new or unproven techniques and technology • The nature of cumulative environmental effect • The nature, scale, and complexity of the program • Whether there was limited scientific knowledge about the effects identified in the Project EIS" ***As stated throughout the EIS Section in the relevant VC chapters, Equinor Canada is committed to the development of a follow-up monitoring program as required by Section 9.2 of the EIS Guidelines. The design of the follow-up monitoring program will be undertaken following finalization of Project design, taking into account Agency guidance, the terms of the EIS Decision Statement and relevant regulatory requirements.*** ***The follow-up monitoring program will be developed in consultation with the C-NLOPB and relevant government departments (e.g., DFO, ECCC). In addition, Indigenous groups and key stakeholders will be engaged, as appropriate. The design of programs will take into consideration the results***

of other offshore environmental effects monitoring programs (both previous and ongoing) and use technology specifically suited to the monitoring of a production project at 1,200 m water depths and utilize Equinor's global experience in EEM and ongoing research and new technologies. The EEM program design must be reviewed and accepted by the C-NLOPB in order to obtain an Operations Authorization (OA).

Consistent with the effects predictions contained in the EIS, the follow-up monitoring program will focus upon sensitive marine environments (e.g., VMEs/ FCA in the Baccalieu area) and track such matters as drill cuttings dispersion, sedimentation, produced water dispersion and sound emissions.

The EEM program will be developed to achieve one or more of the following objectives:

- ***To provide a database against which short-term or long-term environmental effects of the project can be identified;***
- ***To monitor the effectiveness of mitigation measures;***
- ***Assess actual project impacts against those described in the impact assessment;***
- ***Verify the predictions of environmental effects contained in the EIS;***
- ***To validate the results of modelling (e.g. produced water, sound, drill cuttings);***
- ***To identify and implement remedial measures if unforeseen impacts occur."***

EEM program results will be submitted to the C-NLOPB for review and acceptance. Where monitoring results fall outside of those predicted in the EIS, the appropriate regulatory authorities will be consulted to determine the necessary course of action (for example, the development of additional mitigation, adaptive management, or further follow-up or monitoring).

It is important to note that the follow-up program will change and evolve over the course of the Project life in consideration of: EEM results; new relevant academic and applied research; new and emerging technologies; and, evolving industry best practices, ***consistent with Equinor Canada's commitment to continuous improvement."***

5. Section 18.4.3 will be amended to read as:

"Environmental compliance monitoring programs refers to activities used to ensure compliance with regulatory, ***corporate and Project*** requirements. ***Monitoring programs will be carried out to measure compliance with terms of any permits, approvals or authorizations, including the terms of the EIS Decision Statement, or otherwise measure the environmental performance of the Project.*** Requirements for compliance monitoring are outlined in the Drilling and Production Regulations. Equinor Canada's Environmental Protection Plan (EPP) ***for the BdN Project*** will detail the environmental compliance monitoring plans, procedures, and reporting requirements of the BdN Project, consistent with the requirements of the OWTG and the Environmental Protection Plan Guidelines (NEB et al. 2011). Section 2.10 provides an outline of some the compliance monitoring requirements for the Project. ***In compliance with the prescribed conditions of any permits/approvals/ authorizations (including the CEAA Decision Statement), compliance***

	monitoring results will be reported to the appropriate regulatory body in the required form and frequency and will be shared as required or appropriate. The EPP must be reviewed and accepted by the C-NLOPB in order to obtain an Operations Authorization (OA). In addition to reporting requirements outlined in the Equinor Canada's own ***corporate*** plans and procedures, Equinor Canada will be responsible for various reporting to the C-NLOPB in accordance with the Drilling and Production Guidelines (C-NLOPB and CNSOPB 2017), and Data Acquisition and Reporting Guidelines (C-NLOPB 2011) ***the terms of the EIS Decision Statement***. Incidents will be reported in accordance with the Incident Reporting and Investigation Guidelines (C-NLOPB and CNSOPB 2018)…"

IR-147 **DFO-125**	**Guideline Ref:** Part 2, Section 7.3.3	**EIS Ref:** Appendix D
Context/Rationale	In Appendix D, it is unclear why JASCO modelled sound exposure levels for OTARIID seals when they are not present in the NW Atlantic. Sound modelling results would be more useful if field measurements were made to confirm the model estimates. There have been many "surprises" when models have been compared with underwater recordings, and it would be useful to know if that is the case here; particularly as the canyon structures, changing depths, and multiple sound sources will make actual soundscapes complex (such as described in Appendix L). One particular concern was that the seismic modelling was conducted for a single airgun array source, considering that in Appendix L, and elsewhere in the literature, multipath propagation and more importantly multiple concurrent seismic programmes are common. Such soundscapes are very difficult to model and marine mammals and sea turtles could be exposed to louder and more frequent sound energy than a single modelled seismic array.	
Request **15-Apr-19**	A. Explain why modelling in Appendix D was performed for OTARIID seals. B. Provide a rationale as to why there were not field measurements made to confirm the model estimates. C. Justify rationale for using only a single airgun array source.	
Equinor Response **15-Nov-19**	A. JASCO performs modeling for all three cetacean groups and both pinniped groups as part of our regular modeling processes. In the case of the BdN project, it was an oversight to include otariids as they are not expected to occur in the Project RSA. B. Modelling was undertaken to inform the environmental assessment, to provide an estimated zone of influence for underwater sound from vessels and geophysical (4D seismic) activities associated with the BdN Development. As indicated in Section 11.6 of the EIS, sound monitoring will be undertaken during 4D seismic activities. Information from sound monitoring can be used to validate the predicted sound attenuation from the modelling. C. Sound modelling was not a requirement of the EIS Guidelines, therefore the scope of sound modelling was determined in consultation with Equinor in-house experts on sound and marine life, marine mammal and fish biologists from LGL and sound experts from JASCO Ltd, who performed the modelling. The key output from the modelling are the expected zones of temporary and permanent threshold shifts from a	

	seismic survey. These effects accrue only at close ranges to the seismic source; once the source is sufficiently far away from the source, hearing recovery occurs. Thus, a sustained exposure is needed in order to induce a threshold shift. Seismic surveys must maintain a distance of at least 30 km from each other so that sound from one survey does not mask the desired signal from another. As a result, it is sufficient to accumulate modelling of a single survey is sufficient to assess the possible zone of hearing injury.

IR-148 **DFO-147**	**Guideline Ref:** Part 2, Section 7.3.3; Section 7.3.4	**EIS Ref:** Section 11.1.5.1; Table 11.4
Context/Rationale	There are inconsistencies in the discussion of potential effects throughout Section 11.0 of the EIS. For example, potential environmental effects from decommissioning is inconsistent within Table 11.4 of the EIS.	
Request **15-Apr-19**	Ensure consistency between effects assessment sections and within Section 11.0 of the EIS.	
Equinor Response **15-Nov-19**	Equinor Canada has reviewed Chapter 11 regarding Project-interactions and effects assessment on Marine Mammals and Sea Turtles. The following amendments will be incorporated into Chapter 11. See response to IR-151/DFO-91 regarding Project related interactions with Marine Mammals and Sea Turtles. In Table 11.4, for Decommissioning, interactions for each decommissioning activity (i.e., Decommissioning of FPSO, Decommissioning of Subsea Infrastructure, and Well Decommissioning) with ***"Change in Prey Availability or Quality"*** have been added. For Potential Future Development, Decommissioning interactions with "***Change in Injury and/or Mortality Levels***" and "***Change in Prey Availability or Quality***" have been added. Note that the corresponding edits have also been made in Table 11.7 and Table 11.8. as applicable. Table 11.4 will be amended to read as:	

Table 11.4 Potential Project-VC Interactions and Associated Effects: Marine Mammals and Sea Turtles

Project Component / Activity	Potential Environmental Effects			
	Change in Injury and/or Mortality Levels	Change in Habitat Quality and Use	Change in Prey Availability or Quality	Change in Health
DECOMMISSIONING				
Decommissioning of FPSO	•	•	•	
Decommissioning of Subsea Infrastructure	•	•	•	
Well Decommissioning	•	•	•	
POTENTIAL FUTURE DEVELOPMENT				
Offshore Construction and Installation, and HUC	•	•	•	
Production and Maintenance Operations	•	•	•	•
Drilling Activities	•	•	•	•
Supply and Servicing	•	•	•	
Supporting Surveys	•	•	•	
Decommissioning	•	•	•	

Tables 11.7 and 11.8 will be amended to include ***"change in habitat quality and use"*** under Marine Vessels – Presence; ***"Change in prey availability or quality"*** is added to each decommissioning activity:

SUPPLY AND SERVICING								
Marine Vessels								
Presence	• Change in injury and/or mortality levels • Change in habitat quality and use	A	N	PA	S	N	R	H

DECOMMISSIONING								
Decommissioning of FPSO	• Change in injury and/or mortality levels • Change in habitat quality or use • Change in prey availability or quality	A	L	PA	S	R	R	M-H
Decommissioning of Subsea Infrastructure	• Change in injury levels • Change in habitat quality or use • Change in prey availability or quality	A	L	PA	S	R	R	M-H
Well Decommissioning	• Change in injury levels • Change in habitat quality or use • Change in prey availability or quality	A	N	L	S	S	R	H

Section 11.2.6.1: Decommissioning of FPSO

"The departure of the FPSO and the removal of associated floating equipment may interact with marine mammals and sea turtles ***primarily*** through the underwater sound generated by the FPSO and attending vessels. ***Similarly, underwater sound may also contribute to a change in prey availability or quality***. The potential effects of vessel presence and sound on marine mammals and sea turtles were assessed in Section 11.2.4. ***If supporting surveys are required during decommissioning, the potential effects on marine mammals and sea turtles would be the same as those predicted in Section 11.2.5."***

Section 11.2.6.2: Decommissioning of Subsea Infrastructure

"If subsea infrastructure is removed, underwater sound from attending vessels may interact with marine mammals and sea turtles. ***Similarly, underwater sound may also contribute to a change in prey availability or quality***. The potential effects of vessel presence and sound on marine mammals and sea turtles were assessed in Section 11.2.4***. If supporting surveys are required during decommissioning, the potential effects on marine mammals and sea turtles would be the same as those predicted in Section 11.2.5."***

Section 11.2.6.3: Well Decommissioning

"There is little potential for marine mammals and sea turtles to interact directly with well abandonment activities. There is some potential that marine mammals ***(and their prey)*** may temporarily avoid a localized area around the wellhead during mechanical separation of the wellhead from the seabed. The change in habitat quality or use ***and potential change in prey availability or quality*** as a result of well abandonment will likely be negligible."

IR-149 **DFO-144b**	**Guideline Ref:** Part 2, Section 7.3.3; Section 7.3.8.3	**EIS Ref:** Section 11.1.5.1; Table 11.4; Section 12.1.5.1; Table 12.3
Context/Rationale	It is not always obvious why potential environmental effects were not selected for certain project components/ activities in chapters 11.0 and 12.0. Examples are below. In Table 12.3, potential environmental effects from presence, lighting and sound are noted for supply and servicing, but not for lighting and sound from presence of vessels for hook-up and commissioning. It also is not clear why the only discharge with potential effects is drill cuttings.	
Request **15-Apr-19**	Provide the rationale why potential environmental effects were not selected in Tables 11.4 and 12.3 of the EIS.	

Equinor Response 15-Nov-19	For clarity regarding interactions in Chapter 11 see response to IR-151/DFO-91. With regards to Chapter 12 and the approach used for effects assessment, Equinor Canada reviewed Chapter 12 and realizes the approach to effects assessment, while described throughout the Chapter, required amendments to provide clarity for the reader. Rather than include the edits and amendments in each respective IR for Chapter 12, the amended chapter is appended to this response document (see Appendix G). As amended in Chapter 12, the following text in Section 12.1.5.1 describes the approach to determining interactions for Special Areas. "Information provided in Sections 9.2, 10.2 and 11.2 was used to determine if the Project would interact with those species and/or habitats for which the special areas in the LSA have been identified or designated ***(see Table 12.2). An overview of the potential interactions between each of the Project's planned components and activities and Special Areas, and specifically, the potential for these to result in environmental changes and detectable effects to the various aspects of this VC, are presented in Table 12.4. In accordance with Part 2, Section 3.2 of the EIS Guidelines, the effects assessment of project activities is based on those discharges/activities "with the greatest potential to have environmental effects." This is based on scientific literature, research studies, Indigenous knowledge, input from Indigenous groups and stakeholders, and professional experience of the EIS team. Those Project activities with the potential to interact with the defining features of the Special Areas are the focus of the effects assessment.*** ***As described in Table 12.2, the defining features for those special areas that overlap with the PA and or LSA (excluding the marine traffic route), are based on benthic biogenic habitats (e.g., corals, sponges, corals and sea pens), therefore the focus of the effects assessment will be on those project activities where there is an interaction with the benthic habitat. Based on the effects assessment for Marine Fish and Fish Habitat, it was determined that the installation of subsea infrastructure and the discharge of drill cutting are the primary interactions with benthic habitat. Other interactions (e.g., produced water, waste discharge, air, light and sound) except sound associated with supporting surveys, are very minor in comparison and therefore are not identified as interactions. For those special areas in the vessel traffic route of the LSA, the focus of the assessment will be on vessel traffic and its interactions with the ecological and/or societal value of the special areas (i.e., presence and lighting and sound emissions). The effects assessment focusses on the identified interactions. Where interactions are not identified in the table, there will be no discussion in the relevant effects analysis section."***

IR-150 **DFO-90**	**Guideline Ref:** Part 2, Section 7.3.3, Section 7.3.4	**EIS Ref:** Section 11.1.5.1, Table 11.3
Context/Rationale	In Table 11.3 in Section 11.1.5.1 of the EIS, all assessments for potential environmental effects are listed as "qualitative". Ship strike risk could have been quantified.	
Request 15-Apr-19	In Table 11.3 in Section 11.1.5.1 where possible (e.g., ship strikes), quantify potential environmental effects.	
Equinor Response 15-Nov-19	It is not possible to quantify ship strikes along the vessel traffic corridor in a reliable and meaningful way. Available ship strike models require marine mammal densities and vessel densities along the shipping route and provide the relative probability of a vessel	

	encountering a marine mammal, which some researchers have called the relative risk of a ship strike (e.g., Nichol et al. 2017). The risk of a lethal ship strike can be estimated based on vessel speed. A key and important issue with these types of ship strike models are that they do not generally make any allowance for the fact based on evidence that marine mammals are most likely to avoid oncoming ships. The models as constructed are suitable for determining the co-occurrence of a vessel and whale in both time and space. However, these encounters only result in a collision if the whale is in the top part of the water column occupied by the vessel hull and the whale and vessel do not exhibit any collision avoidance behaviour. More simply, available models can estimate the likelihood that the ships would strike “floating logs’ but are not appropriate for determining the probability that the ships will strike whales. Rockwood et al. (2017) estimated baleen whale mortality from ship strikes offshore California and parameterized collision avoidance by whales using three scenarios based on conservative assumptions (decreasing avoidance with increasing vessel speed, constant avoidance assuming 55%, and no avoidance). Assumptions used in the model and the lack of fine-scale density data limit the model predications and the authors note that validating the model is challenging (Rockwood et al. 2017). Likewise, any ship strike model that could be undertaken for the BdN Project would have to be based on broad assumptions about vessel avoidance and limited (to no) marine mammal density estimates. A key thing to note is that there have been no specific areas along the shipping transit route to the Project Area that have been identified as marine mammal breeding grounds, feeding concentrations, and/or migration route. Consistent with *International Regulations for Preventing Collisions at Sea, 1972* with Canadian Modifications, Rule 5, every vessel maintains a proper lookout at all times. Project vessels will alter course and/or reduce speed if a marine mammal(s) (or sea turtle) is detected ahead of the vessel. The following mitigation will be added to the list of mitigations in Section 11.1.5.2 of the EIS: ***“Consistent with International Regulations for Preventing Collisions at Sea, 1972 with Canadian Modifications, Rule 5, every vessel shall maintain a proper lookout at all times. Project vessels will alter course and/or reduce speed if a marine mammal(s) (or sea turtle) is detected ahead of the vessel.”*** References: Nichol, L.M., Wright, B.M., O’Hara, P., and Ford, J.K.B. 2017. Assessing the risk of lethal ship strikes to humpback (*Megaptera novaeangliae*) and fin *(Balaenoptera physalus*) whales off the west coast of Vancouver Island, Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2017/007. vii + 33 p. Rockwood, RC, Calambokidis, J, Jahncke, J (2017) High mortality of blue, humpback and fin whales from modeling of vessel collisions on the U.S. West Coast suggests population impacts and insufficient protection. PLOS ONE 12(8): e0183052. https://doi.org/10.1371/journal.pone.0183052.

IR-151 **DFO-91**	**Guideline Ref:** Part 2, Section 7.3.3 Marine Mammals	**EIS Ref:** Section 11.1.5.1, Table 11.4
Context/Rationale	Lighting of permanent offshore structures and attendant vessels could result in change in habitat quality or use by marine mammals, as these lights could attract prey or displace light-averse marine mammals. This information is needed in Section 11.1.5.1 of the EIS to fully assess environmental effects of the Project.	
Request **15-Apr-19**	Provide the rationale why lighting effects on marine mammals was not included in Table 11.4 of the EIS.	
Equinor Response **15-Nov-19**	As stated in responses to IR-13/CEAA-6; DFO-1 Part H and IR-218/DFO-152, in accordance with Part 2, Section 3.2 of the EIS Guidelines, the effects assessment of project activities was based on those discharges/activities "with the greatest potential to have environmental effects." To the best of Equinor's knowledge, there are no studies to demonstrate that marine mammals avoid or are attracted to lights on offshore installations and attendant vessels. The primary sensory cues for marine mammals in water are auditory. There is a slight chance that marine mammals may approach an offshore installation because prey are attracted to the lights. For the environmental effects assessment, the focus was on the project activities that have the greatest potential for environmental effects. In addition, it is assumed that underwater sound and the physical presence of structures would deter such a close approach; this was the rationale for not including an interaction with lighting. For clarity the following text will be added to Section 11.3 of the EIS: ***"In accordance with Part 2, Section 3.2 of the EIS Guidelines, the effects assessment of project activities is based on those discharges/activities "with the greatest potential to have environmental effects." This is based on scientific literature, research studies, Indigenous knowledge, input from Indigenous groups and stakeholders, and professional experience of the EIS team. For Marine Mammals and Sea Turtles, the primary sensory cues for marine mammals in water are auditory. Other interactions (e.g., lighting, air emissions, and marine discharges during HUC activities) are very minor in comparison and therefore are not identified as interactions."***	

IR-152 **CEAA-75**	**Guideline Ref:** Part 2, Section 7.1.2, Section 7.3.3, Section 7.4, Section 7.5	**EIS Ref:** Sections 11.1.5.1, Section 11.2.1.1
Context/Rationale	In Section 11.2.1 of the EIS, the displacement effect from construction and installation activities is considered to be short term; however, this phase is between two to three years in duration (Section 2 Table 2.1 of the EIS), seasonally and year round. Short term, by Equinor's definition, is a duration which is less than 12 months (Section 4 Table 4.5 of the EIS). In Section 11.2.2.1 of the EIS the predicted effects are considered short term behavioural effects on marine mammals from the FPSO sounds, yet the FPSO will be on location for 12 to 20 years. As per Section 7.2 of the EIS Guidelines predicted changes in the environment must be described. Clarity is required on duration of project activities to understand the interactions between VCs and the project. As noted in Section 11 of the EIS, the Core BdN Area occurs in deep water habitat that supports specific prey items for certain deep diving cetacean species, one of which is the northern bottlenose whale which is a species at risk.	

	Potential interactions and effects noted in Tables 11.3 and 11.4 of the EIS are generic to all marine mammals. The zone of influence to result in avoidance behaviour (120 dB) in a three dimensional graphic was not provided to clearly show the affected area. This information will show if submerged marine mammals and their specific prey may be exposed to and affected by sound emissions from the various project activities singularly and cumulatively.
Request 15-Apr-19	A. Clarify the duration of project phases in the effects analysis ratings. B. Discuss and provide a graphic showing sound exposure levels with depth to demonstrate the zone of influence through the water column. provide information on how changes in prey, and what prey, identified in Table 11.3 and 11.4, may affect marine mammals and sea turtles. C. Provide the rationale that all marine mammals and their respective habitats in the Core BdN Development Area and Project Area will be affected in the same manner for each project activity under each project phase, and cumulatively for simultaneous operations.
Equinor Response 15-Sep-19	A. Per the EIS Guidelines, the “EA will include a consideration of the predicted changes to the environment…The magnitude, geographic extent, duration, timing and frequency of the changes should be described…” As defined in Table 4.5 of the EIS “Duration” refers to the predicted duration of an effect and not the duration of a Project activity or phase. For example, while the FPSO may be on location for 12-20 years, as indicated in Section 11.2.2.3 “the residual environmental effects on Marine Mammals and Sea Turtles from the presence of the FPSO and subsea infrastructure are predicted to be…short-term in duration…” The effects analysis in the EIS considers the duration of the effect, therefore changes to the effects analysis are not required. B. The EIS Guidelines do not provide any guidance regarding zones of influence. As such the approach used in the BdN EIS in describing zones of influence is consistent with standard EA methods employed in environmental assessments for a variety of industries. A standard procedure in effects analysis for underwater sound is to consider a zone of influence for effects based on received sound levels in the horizontal plane. This was the approach taken in the BdN EIS. As described in the JASCO acoustic modelling report (Appendix D of the EIS), the underwater sound fields predicted by the acoustic propagation models were sampled such that the received sound level at each point in the horizontal plane was taken to be the maximum value over all modelled water depths for that point. As such, the predicted sound level at a given distance from the sound source represents the maximum value sampled in the water column. Given this, the effects assessment for marine mammal prey (i.e., fish and invertebrates presented in Chapter 9 of the EIS) already takes into consideration (in a precautionary manner) the variability of sound in the water column. The Local Study Area for Marine Mammals and Sea Turtles is defined based on the zone of influence from sound emissions and represents a 50 km distances around the Project Area. A 3D graphic is not necessary to conduct the effects analysis. The effects assessment for potential Change in Prey Availability or Quality for marine mammals and sea turtles is closely linked to the effects assessment presented for Fish and Fish Habitat in Chapter 9 (see Table 9.5). C. Equinor Canada disagrees with the reviewer’s comment that the EIS concludes that all marine mammals will be affected in the same manner for each Project activity across all phases and in consideration of other offshore activities. For example,

	Section 11.1.4 of the EIS states "Behavioural reactions of marine mammals to sound are difficult to predict in the absence of site and context-specific data. Reactions to sound, if any, depend on species, state of maturity, experience, current activity, reproductive state, time of day, and many other factors (Richardson et al. 1995; Wartzok et al. 2004; Southall et al. 2007; Weilgart 2007; Ellison et al. 2012)." Similarly, the effects literature considered in the EIS for various Project activities clearly highlights the variability in marine mammal response to relevant anthropogenic activities. The summaries of effects predictions for the Core BdN Development and Potential Future Development for marine mammals provided in Tables 11.7 and 11.8, respectively, clearly demonstrates the variability in environmental effects descriptors used to derive significance predictions. Updates to the EIS are not required.

IR-153 **CEAA-76**	**Guideline Ref:** Part 2, Section 7.1.2, Section 7.3.3, Section 7.4, Section 7.5	**EIS Ref:** Section 11.2.1.1
Context/Rationale	In Section 11.2.1.1 of the EIS, the natural variability in prey items for marine mammals or their prey items have not been discussed in order to make a prediction on changes in prey availability or quality. Fish, in general, are expected to be attracted to vessels from lights attracting their prey items and organic waste discharge. Although there may be confounding avoidance response from noise which has not been considered. The expected dominant effect (cumulative effect) was not addressed. The cumulative effects assessment on marine mammals does not appear to use information in Section 6 on prey items for marine mammals, the epipelagic and mesopelagic habitats, and food webs in the Core BdN Development Area and Project Area and does not link the zones of influence of sound and light with distance and water depth. This analysis allows the Agency to review Equinor's determination of significance of effects for each project activity under each project phase based on the identified interaction.	
Request **15-Apr-19**	Assess the potential Project and cumulative effects on marine mammals.	
Equinor Response **15-Nov-19**	Regarding inter- vs intra-Project effects, refer to response on IR-219/Conformity DFO-4. As stated in response to IR-219/Conformity DFO-4, it is the opinion of Equinor Canada that the assessment of the cumulative effects of the Project in combination with other projects and activities in relation to marine mammals and sea turtles satisfies the requirements the EIS guidelines and Agency guidance documents. The cumulative effects (CE) approach is also consistent with the CE approach used in recently completed offshore environmental assessments under CEAA 2012. As identified in Chapter 11, with clarification provided in response to IR-151/DFO-91, the primary interaction for marine mammals in the water column are auditory. Therefore, the CE approach for the Marine Mammals and Sea Turtle VC, Section 15.4.2 of the EIS provides direction as to the focus of cumulative effects assessment on this VC. "Potential interactions with, and effects on, Marine Mammals and Sea Turtles as a result of the Project relate to possible injury/mortality or disturbance from vessel movement, sound, and discharges. The primary pathways for potential residual effects on marine mammals are those associated with increases in underwater sound and vessel traffic that may result in change in mortality or injury or change in habitat quality or use (behavioural effects).	

	While other potential pathways include change in prey availability or quality or change in health (contaminants) the focus of the cumulative effects discussion is on effects from sound." Updates to the EIS are not required.

IR-154 **DFO-22**	**Guideline Ref:** Part 2, Section 7.3.3	**EIS Ref:** Section 11.2.5.1
Context/Rationale	In Section 11.2.5.1 of the EIS, regarding masking of sound in mysticetes, it is stated that "…. masking of sounds may occur during seismic surveys, at least in areas proximate to the sound source. Any masking effects are considered to be relatively short-term and are not predicted to extend beyond the duration of the seismic survey (two weeks)." However, based on the project description in Section 2.6.5 and again in Section 11.2.5.1, seismic surveys may last up to 4 weeks, "Permanent reservoir monitoring seismic surveys are estimated to take approximately two weeks to complete and could be carried out twice per year. Conventional seismic surveys could be between two and four weeks and occur as frequently as once per year in early Project life, with reduced frequency in later years."	
Request **15-Apr-19**	Clarify the statement on the masking effects of mysticetes lasting two weeks when surveys may take up to four weeks and update the effects assessment if necessary.	
Equinor Response **15-Nov-19**	The text in EIS in Section 11.2.5.1, will be amended to read as: "Any masking effects are considered to be relatively short term and are not predicted to extend beyond the duration of the seismic survey (***approximately*** two ***to four*** weeks)."	

IR-155 **DFO-92**	**Guideline Ref:** Part 2, Section 7.4	**EIS Ref:** Section 11.1.5.2
Context/Rationale	The Federal government is going to have a technical meeting in May 2019 to consider updating the Statement of Canadian Practice (SOCP) to better reflect recent science and operator experiences. The bullets in Section 11.1.5.2 of the EIS should reflect these possible changes and the assumption that the operator would abide by these.	
Request **15-Apr-19**	Update mitigations to reflect adherence to changes to the Statement of Canadian Practice (SOCP).	
Equinor Response **15-Nov-19**	Equinor Canada Ltd understands that regulations, guidelines, legislation may change and/or be amended during the life of the Project. When guidelines, regulations, etc. are referenced in the EIS, with a reference date, it does not imply that new or amended mitigations or requirements stemming from updates would not apply to the Project. For clarity the text in Section 1.3.4 of the EIS will be amended to read as: ***"***A list of some of the key legislation, regulations and associated approvals that may be required in relation to offshore oil and gas activities are provided in Table 1.1. ***A reference in the EIS to legislation, regulations or guidelines refers to such legislation, regulations or guidelines as amended from time to time over the life of the Project."***	

IR-156 **DFO-93**	**Guideline Ref:** Part 2, Section 7.3.3, Section 7.4, Section 7.6.3	**EIS Ref:** Section 11.2.1.1, Section 11.2.4.1, Section 15.4.4.1
Context/Rationale	In Section 11.2.1.1 of the EIS the Proponent states that *"Given that vessels engaged in construction and installation activities will be either stationary or transiting at slow speeds, the potential for ship strikes is considered low."* (page 11-16). Section 15.4.4.1 of the EIS states "It is uncertain how many marine mammals may be struck by vessels in the RSA. Since 2002, there have been two reports of supply vessels striking a whale at night on the Grand Banks; however, the whales were not re-sighted to allow confirmation of the incidents and such ship strikes are considered rare (Lawson, J., pers. comm., June 2018)." (pages 15-45 to 15-46). There have been several reports of supply or crew vessels striking large whales enroute to/ from offshore oil installations. There are also a number of dead large whales sighted on the Grand Banks that do not show evidence of net entanglement. These events suggest that ship strike may be an issue that, while seemingly a rarely-occurring event, could nonetheless be significant if a ship strikes a SARA-listed species. Although offshore ship strikes by large vessels are rarely detected and/ or reported, this is not the same as concluding that such events are rare overall. Worldwide, few whales that die at sea of manmade causes (or otherwise) are ever detected, and there are reports elsewhere of large vessels being unaware they have struck whales until they arrive back at port with a dead animal wrapped on their bows. The EIS report concludes various operational impacts will be unlikely given *"the implementation of mitigation measures".* For ship strikes, it cannot be determined what mitigation measures will be applicable - other than "use of common routes". The EIS states that the Proponent will report ship strikes to DFO, but this is not a mitigation. The Proponent will not enact slowdowns and will travel at speeds at the discretion of the captains. The EIS correctly states that *"it is possible that groups of foraging marine mammals may be encountered along the route during summer months"* (page 11-28)*;* to potentially mitigate the risk of ship strike, reporting of such aggregations to DFO and more importantly to vessels operating or planning to transit the area, would likely have some benefit for the whales (assuming the vessel might slow down when an aggregation is detected, or post lookouts on other transmitting vessels). It is recommended that the Proponent implement a reporting system to alert vessels transiting the PA of whale aggregations or feeding animals.	
Request **15-Apr-19**	A. In Sections 11.2.1.1 and 15.4.4.1 of the EIS re-characterize the likelihood of ship strikes based on reports. B. Describe mitigation measures proposed for ship strikes that result in unlikely operational impacts. C. Provide information on dedicated onboard observers. D. Discuss whether increased vessel reporting of marine mammals sightings can potentially better able other vessels to avoid feeding aggregations of whales, or surface active groups of right whales.	
Equinor Response **15-Nov-19**	It is the opinion of Equinor Canada and our EIS team that the likelihood of ship strikes has been characterized correctly in the EIS - the risk is considered low and indeed, DFO's Research Scientist (Dr. J. Lawson) has indicated the same, as referenced in the EIS and in response to IR-150/DFO-90. Furthermore, if ship strikes were an issue for transiting vessels supporting the ongoing Newfoundland offshore oil industry the number of reported ship strikes would be higher. It is highly unlikely that surface active groups of North Atlantic right whales will occur along the vessel traffic route to the Project Area. As a	

	reminder, the number of Project vessels transiting to the Project Area is relatively low (see Table 2.8 in the EIS), with, at most, one vessel travelling along the transit route per day and no Project vessel transits on some days. The vast majority of oceangoing vessels, including commercial fishing vessels, in Canada are not required to have dedicated marine mammal observers. Based on the low risk of ship strikes, the low numbers of reported ship strikes, and given that the vessel-traffic corridor is not within specific areas that have been identified as marine mammal breeding grounds, feeding concentrations, and/or migration routes, dedicated onboard MMOs on vessels supporting the BdN project are not deemed appropriate. As stated in response to IR-150/DFO-90 the following mitigation will be included in the EIS: ***"Consistent with International Regulations for Preventing Collisions at Sea, 1972 with Canadian Modifications, Rule 5, every vessel shall maintain a proper lookout at all times. Project vessels will alter course and/or reduce speed if a marine mammal(s) (or sea turtle) is detected ahead of the vessel.***" It is beyond the scope of the environmental assessment to determine if increased reporting of marine mammal sightings amongst vessels will allow vessel operators to better avoid feeding or socializing aggregations of whales. As described in the EIS (Section 6.3.7.2), it is highly unlikely that surface active groups of North Atlantic right whales will occur along the shipping route to Equinor's Project Area. If a North Atlantic right whale(s) is detected by Project vessel crew, the sighting(s) will be reported immediately to DFO.

IR-157 **DFO-94**	**Guideline Ref:** Part 2, Section 7.1.16	**EIS Ref:** Section 11.2.2.1
Context/Rationale	In the study area, the data does not support the conclusion in Section 11.2.2.1 of the EIS that baleen whales "are typically more abundant on the continental shelf". DFO is of the view that sightings data are biased since most records are collected by observers on the Banks, rather than off.	
Request **15-Apr-19**	Explain the ability to provide a moderate to high confidence level on the predicted effects of the Project on cetaceans with the paucity of observation data in the project areas.	
Equinor Response **15-Nov-19**	It is generally well accepted that baleen whale species in the Northwest Atlantic occur more regularly in continental shelf (e.g., Grand Banks) waters where they are known (or assumed) to forage. Conversely, most large odontocetes (e.g., beaked whales, sperm whales) occur more regularly in deeper waters (slope, basin). The reviewer is correct that there have been more systematic and opportunistic sighting efforts on the Banks relative to deeper waters; however, this does not mean that the statement on baleen whale distribution is inaccurate. The confidence level for effects predictions for marine mammals considers many factors in addition to baseline data specific to the Project Area including the effects literature, the nature of specific Project activities, modelling approach and effectiveness, and efficacy of mitigation measures. While confidence ratings range from moderate to high, when considering multiple concurrent project activities, as noted in Section 11.5.2, in light of uncertainties the overall confidence rating is moderate. The reviewer is referred to Section 11.5.2 of the EIS, which considers the limited baseline data for marine mammals (and sea turtles) in the overall significance determination for the Project. Section 11.5.2 states:	

	"The Project is not predicted to jeopardize the overall abundance, distribution, or health of SAR. With mitigation and environmental protection measures, the residual environmental effects on Marine Mammals and Sea Turtles (including SAR) are predicted to be not significant. This overall determination is generally made with a moderate level of confidence given there are several uncertainties in predicting the effects of the Project on Marine Mammals and Sea Turtles. There are limited baseline data on Marine Mammal and Sea Turtle use of the Project Area. Therefore, there is uncertainty as to whether the Project Area or certain portions of the Project Area are regularly used as important foraging areas, migratory corridors, and/or breeding areas for marine mammals - particularly northern bottlenose whales. There is also uncertainty due to the lack of systematic information on marine mammal response to multiple, concurrent oil and gas activities, like those that will occur periodically during the Project." Updates to the EIS are not required.

IR-158 **DFO-95**	**Guideline Ref:** Part 2, Section 7.3.3, Section 7.3.4	**EIS Ref:** Section 11.2.2.1; Appendix D
Context/Rationale	Although sound will not propagate as well onto the shelf, sound fields around the FPSO and other vessels sources will still likely result in mammal displacement and masking in an area tens of kilometres in diameter, yet no mitigation measures are described in Section 11.2.2.1 of the EIS to address this noise issue. Because sound field mapping is based on acoustic modelling, (EIS Appendix D), acoustic modelling should be field tested as a monitoring and mitigation measure to ensure that the bathymetric and geological features of this area do not result in higher sound propagation than modelled. This applies to the relevant sound discussions in every subsection.	
Request **15-Apr-19**	Describe mitigation measures that the proponent will use to minimize effects of sound on marine mammal displacement and masking.	
Equinor Response **15-Nov-19**	It is quite possible that sound measurements may differ (either lower or higher) from modelled values of the FPSO. Regardless, available information generally indicates that avoidance effects are likely to be localized and marine mammals may habituate to a constant, and in the case of the FPSO, stationary sound source. It is unlikely that marine mammals will avoid the FPSO and attending vessels and experience masking at distances of tens of kilometres. Also, the potential for hearing impairment effects on marine mammals from sound emitted by the FPSO is considered very limited. In terms of mitigations to reduce effects on marine mammals and sea turtles, as stated in Section 11.1.5.2, Equinor Canada will implement mitigations measures outlined in the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP) (DFO 2007), when geophysical air source arrays are used. This includes implementing shut downs of the air source array(s) when SAR listed as Endangered or Threatened on Schedule 1 of SARA (as well as all beaked whale species) are detected within the safety zone during anytime air sources are active, including ramp up. A marine mammal and sea turtle observation plan for 4D seismic surveys will be developed. In addition, as stated in Section 11.6, Equinor Canada has committed to monitor sound transmission for its 4D seismic surveys, which have the potential to impair marine mammal hearing at close range. Updates to the EIS are not required.	

IR-159 **DFO-162**	**Guideline Ref:** Part 2, Section 7.3.3, Section 7.3.4	**EIS Ref:** Section 11.2.3.1
Context/Rationale	Section 11.2.3.1 of the EIS states that “Results of the assessment presented in Chapter 9 suggest that effects from presence and operation of the drilling installation is negligible”, is inconsistent with Table 9.15, which shows a low magnitude effect.	
Request **15-Apr-19**	Clarify the inconsistency between the statement in Section 11.2.3.1 and the effects analysis ratings in Section 9 of the EIS.	
Equinor Response **15-Nov-19**	The sentence in Section 11.2.3.1 of the EIS will be revised to read as: “Results of the assessment presented in Chapter 9 suggest that effects from presence and operation of the drilling installation will be ***low in magnitude and in a localized area****,* and as such, indirect effects on change in food availability or quality for marine mammals and sea turtles are not expected to the degree that would translate into effects on the abundance, distribution, or health of these species.*”*	

IR-160 **DFO-96**	**Guideline Ref:** Part 2, Section 7.3.3, Section 7.3.4	**EIS Ref:** Section 11.2.3.1;
Context/Rationale	In Section 11.2.3.1 of the EIS states "Sound attenuates less rapidly in the shallow Beaufort Sea where these experiments were conducted than in temperate waters with greater depths." It is DFO’s view that generally sound attenuates more rapidly in shallower waters.	
Request **15-Apr-19**	Revise statement on sound attenuation and update the effects analysis as necessary.	
Equinor Response **15-Nov-19**	The statement as written is correct. However; for clarification, the text in Section 11.2.3.1 of the EIS will be amended to read as: “Sound ***is likely to*** attenuate less rapidly in the Beaufort Sea where these experiments were conducted than in temperate waters at ***similar*** water depths ***(Miles et al. 1987)****.*” Reference: ***Miles, P.R., C.I. Malme and W.J. Richardson. 1987. Prediction of drilling site-specific interaction of industrial acoustic stimuli and endangered whales in the Alaskan Beaufort Sea. BBN Rep. 6509; OCS Study MMS 87-0084. Rep. from BBN Labs Inc., Cambridge, MA, and LGL Ltd., King City, Ont., for U.S. Minerals Manage. Serv., Anchorage, AK. 341 p. NTIS PB88-158498.***	

IR-161 **DFO-97**	**Guideline Ref:** Part 2, Section 7.3.3, Section 7.6.3	**EIS Ref:** Section 11.2.5.1, Section 15.4.3, Table 15.9, Section 15.4.4.1, Section 15.4.4.2, Section 15.4.6, Table 15.10, Appendix L
Context/Rationale	The conclusion that seismic array operation might result in *"*avoidance responses … typically localized and temporary*"* (page 11-35) does not appear consistent with other studies.	

	There have been studies that have demonstrated a reduced density of marine mammals near array operations, and this displacement can last for days or weeks. This may be particularly problematic when there are multiple seismic operations detectable in an area of the Grand Banks (such as in the northern Flemish Pass study area during 2018 when an acoustic receiver recorded multiple, overlapping seismic pulses for many weeks). In this case, it is difficult to imagine where a low-frequency hearer such as a baleen whale could respond in a way that would reduce its exposure to the many seismic pulses, and yet remain in this area to feed or migrate. The fact that some marine mammals remain in areas exposed to multiple seismic pulses highlights the likely importance of these areas to these whales. The statement that *"Because of the intermittent nature and low duty cycle of seismic pulses, marine mammals and sea turtles can receive and emit (in the case of marine mammals) sounds in the relatively quiet intervals between pulses"* might only be true close to the array (and not further away where acoustic "smearing" can fill the interpulse period with some sound) or when only one array is operating. In the case of the Grand Banks areas, and for many years, multiple concurrent seismic operations have rendered false the statement that *"Situations with prolonged strong reverberation are considered infrequent"*. The Proponent cites the recent ESRF report by JASCO (Maxner et al. 2018) which contains figures illustrating the multiple, overlapping seismic pulses from the three concurrent seismic surveys undertaken on the Grand Banks that year. DFO is of the view that seismic activities in Newfoundland and Labrador contribute to the acoustic energy in the marine environment. As expected, there is significant uncertainty around the conclusions of cumulative impacts when there are multiple, acoustically-overlapping seismic programs, which is reflected in the EIS: "Air source sound from multiple concurrent seismic surveys in the RSA has the potential to contribute to cumulative effects. However, the nature and magnitude of these cumulative effects on Marine Mammals and Sea Turtles are not known with certainty. Potential effects are likely minimized by the minimum separation distance typically required between seismic surveys (i.e., 30 km; see LGL 2017a)." (page 15-44) "spatial separation between seismic surveys (typically a minimum of 30 km; LGL 2017b)." and "In recent years, there has been as many as three concurrent 3D seismic surveys in slope waters around the Project Area with a concurrent 2D seismic survey offshore Labrador (LGL 2017b). It is uncertain how a marine mammal will respond to sound arriving from multiple sources and possibly from multiple directions" (page 15-46) "Situations with prolonged strong reverberation are considered infrequent. The degree to which reverberation will contribute to potential masking for marine mammals in and near the Project Area is uncertain…" (page 15-48) "The effects of a single geophysical seismic survey are expected to result in localized and temporary behavioural effects on marine mammals (and sea turtles which may occur in the area); however, there is some uncertainty in how marine mammals will respond to potentially, multiple concurrent seismic surveys." (page 15-54) The supporting Appendices detailing recorded sounds in the study area demonstrated that reverberation and multipath effects result in almost no "quieter" periods between received seismic shots over large areas of offshore Newfoundland and Labrador when concurrent array firing is occurring. Multipath propagation and concurrent seismic programmes make for a very complicated and noisy deep water environment (Figures 18, 20 in Appendix L).

	Such anthropogenic noise is bound to result in behaviour and distributional changes in a variety of marine species, and as described in the EIS, Project monitoring will not adequately measure this. The only approach that might mitigate this would be to greatly enlarge the separation of such operations, or eliminate concurrent seismic operations altogether. Further acoustic monitoring is essential to better understand this acoustic regime.
Request 15-Apr-19	A. Update the description of avoidance responses to seismic surveys considering the studies cited by DFO and revise the EIS, as necessary. B. Update the description for masking, considering acoustic "smearing" and revise the EIS, as necessary. C. Determine whether there are additional mitigation measures required (e.g., minimizing acoustic overlap and long-term shooting) for seismic sound. D. Update effects assessment and cumulative effects assessment, as necessary.
Equinor Response 15-Nov-19	It is unclear which "studies cited by DFO" the reviewer is referencing in their request. The EIS provides a thorough review of marine mammal behavioural responses, including avoidance, to seismic surveys as well as reference to other documents that have reviewed the relevant literature. The reviewer is referred to Section 11.2.5.1 of the EIS. Acoustic smearing was taken into consideration in the EIS. In most situations, strong air source sound will only be received for a brief period (<1 s), with these sound pulses being separated by at least several seconds of relative silence, and longer in the case of deep-penetration surveys or refraction surveys. As outlined in Appendix 4 of LGL (2015a; which is referenced in Section 11.2.5.1 of the Equinor Canada EIS), seismic sound pulses received at any given point may arrive via a direct path, indirect paths that include reflection from the sea surface and bottom, or often indirect paths including segments through the bottom sediments. Sounds propagating via indirect paths travel longer distances and often arrive later than sounds arriving via a direct path. These variations in travel time have the effect of lengthening the duration of the received pulse (i.e., smearing), or may cause two or more received pulses from a single emitted pulse. Near the source, the predominant part of an air source pulse is ~10 to 20 ms in duration. In comparison, the pulse duration as received at long horizontal distances can be much greater. For example, for one air source array operating in the Beaufort Sea, pulse duration was ~300 ms at a distance of 8 km, 500 ms at 20 km, and 850 ms at 73 km (Greene and Richardson 1988). As described in Section 15.4.4.2, the uncertainty in effects predictions for marine mammals (behavioural response and masking) increases in consideration of potential multiple concurrent seismic surveys near the Project Area including increased instances of reverberation of air source pulses. Seismic surveys conducted by Equinor Canada as part of the Project will be relatively short-term (i.e., two to four weeks) and in a fixed, relatively small area; scheduling is anticipated to be known well in advance of the survey. Mitigations to be implemented during geophysical surveys where air source arrays are used are listed in Section 11.5.2. In addition, the following mitigation will be added to Section 11.5.2 ***"Equinor Canada will communicate seismic survey plans to the C-NLOPB and geophysical operators to reduce concurrent seismic surveys and/or to maximize the separation distance between surveys to the extent possible***". As noted in Section 11.6, Equinor Canada will monitor sound levels during its 4D seismic surveys.

	References: ***Greene, C.R., Jr. and W.J. Richardson. 1988. Characteristics of marine seismic survey sounds in the Beaufort Sea. J. Acoust. Soc. Am. 83(6):2246-2254.*** LGL. 2015a. Environmental Assessment of WesternGeco's Eastern Newfoundland Offshore Seismic Program, 2015-2024. LGL Rep. FA0035. Prepared by LGL Limited in association with Canning & Pitt Associates Inc., St. John's, NL for WesternGeco (Division of Schlumberger Canada Limited), Calgary, AB, 255 pp. + appendices.

IR-162 **DFO-6**	**Guideline Ref:** Part 2, Section 7.1.5	**EIS Ref:** Section 6.3.7.10, Section 6.3.5.1
Context/Rationale	In Sections 6.3.7.10 and 6.3.5.1 of the EIS, based on Figure 6-63, Leatherback and Loggerhead Sea Turtles are also located east of the Project Area. Additionally, numbering for 6.3.5.1 is incorrect.	
Request **15-Apr-19**	Based on information depicted in Figure 6-63, revise Sections 6.3.7.10 and 6.3.5.1 of the EIS with respect to leatherback and loggerhead sea turtle distribution. Revise numbering from Section 6.3.5.1.	
Equinor Response **15-Nov-19**	The sentence in the Section 6.3.7.10 of the EIS will be revised to read as: "Offshore NL, leatherbacks have been regularly recorded but typically well south ***and east*** of the Project Area (Figure 6-63)." Similarly, the sentence in Section 6.3.7.11 (incorrectly labelled 6.3.5.1) will be revised to read as: "Loggerhead turtles are considered rare in the Project Area with recorded sightings occurring well south ***and east*** of the Project Area (6-63)." Section numbering has been corrected in the EIS. Section 6.3.5.1 is now Section 6.3.7.11	

IR-163 **CEAA-77**	**Guideline Ref:** Part 2, Section 7.1.2, Section 7.3.3, Section 7.4, Section 7.5	**EIS Ref:** Sections 11.2.3.1
Context/Rationale	Section 11.2.3.1 of the EIS recognizes the ecological connectivity of fish and invertebrate health, abundance and distribution and potential indirect effects on marine mammals and sea turtles. Changes to sea turtle food (jellyfish) within and above natural variability were not assessed. Information on changes in prey for marine mammals and sea turtles is required to substantiate the effects analysis.	
Request **15-Apr-19**	Provide information of changes in sea turtle habitat quality and quantity related to natural variability to support the effects analysis conclusions.	
Equinor Response **15-Sep-19**	Sea turtles are considered rare in the Project Area as described in Section 6.3.6.1, Section 6.3.6.2, Section 6.3.7.10 and Section 6.3.7.11 (formerly stated in error as Section 6.3.5.1). There have been no reported sightings of sea turtles in or near the Project Area. For clarity, the text in Section 11.2.3.1 of the EIS will be amended to read as: "Results of the assessment presented in Chapter 9 suggest that effects from presence and operation of the drilling installation will be ***of low magnitude and in a localized area,*** and as such, indirect effects on change in food availability or quality for marine	

	mammals and sea turtles are not expected to the degree that would translate into effects on the abundance, distribution, or health of these species." The probability of sea turtles being indirectly affected by changes in prey availability in the Project Area because of the presence of drilling installation is considered highly unlikely and does not warrant a detailed effects analysis.

IR-164	**Guideline Ref:** Part 2, Section 7.1.4	**EIS Ref:** Section 6.2
ECCC-14		
Context/Rationale	In Section 6.2 of the EIS the current colony size estimates are out of date and can be updated, but will not change the overall content of the EIS. More recent information on colony size estimates is available from ECCC upon request.	
Request **15-Apr-19**	In Section 6.2 of the EIS update colony size estimates from ECCC upon request.	
Equinor Response **2-May-19**	Equinor Canada provided the following response to this IR in May 2019. *As indicated by ECCC, the information does not change the content of the EIS. Equinor notes the existence of updated information and thanks ECCC for providing the information.*	
ECCC Response **10-Jun-19**	ECCC has no further comments.	

IR-165	**Guideline Ref:** Part 2, Section 7.1.4	**EIS Ref:** Section 6.2.2.2
ECCC-17		
Context/Rationale	In Section 6.2.2.2 of the EIS "Leach's storm-petrel is by far the most numerous species stranding on drilling and production installations and offshore supply vessels (OSVs) in the NL Offshore Area. Stranding data from Equinor Canada activities in the Project Area were collected on 1,755 days from 2008 to 2016 from exploration activities conducted during every month of the calendar year over this period. Of a total of 282 birds recovered, 252 were released alive. Leach's storm-petrels comprised 81 percent of the stranded birds. During the Equinor Canada 2018 Seabed Survey, a total of 276 Leach's Storm-petrels were found stranded on the survey vessel. One stranding occurred during the period of 1 October to 8 October. On the night of 5/6 October 255 Leach's Storm-petrels were stranded. The weather had been foggy on 5 October but was clear on 6 October. Overall a total of 262 Leach's storm-petrels were released alive and 14 were found dead." The quote above states that 282 birds were recovered between 2008 and 2016, and 276 were recovered in 2018 alone (the majority of which stranded on one night in October). To better understand potential effects of activities on the birds, additional information about the seasonal timing of the recoveries from 2008-2016 should be provided, as is done with the 2018 survey results. It is important to state that Leach's Storm-petrel strandings peak on offshore installations in September and October, the timing of which coincides with the fledging period of this species. Millions of Storm-petrels are likely passing through the Project Area during this time (specifically mid-September to mid-October) as they cross the Atlantic and migrate south for the winter (Pollett et al. 2014). There may also be Leach's Storm-petrels in the Project Area during the winter months. See also Pollet et al. 2018 for information on over-wintering movements of Leach's Storm-	

	petrel, which demonstrates that some individuals remain in the Northern Hemisphere throughout the winter. Pollett, I.L., Hedd, A., Taylor, P.D., Montevecchi, W.A., and Shutler, D. (2014). Migratory movements and wintering areas of Leach's Storm-Petrels tracked using geolocators. Journal of Field Ornithology. 85(3): 321-328. Pollett, I.L., Ronconi, R.A., Leonard, M.L., and Shutler, D. (2018). Migration routes and stopover areas of Leach's Storm Petrels *Oceanodromoa leucorhoa*. Marine Ornithology. 47: 53-63.
Request 15-Apr-19	A. Provide additional information about the seasonal timing (temporal boundaries) of the 2008-2016 recoveries of Leach's Storm-petrels related to Equinor's offshore project activities. B. Provide an analysis on the project phases overlapping with Leach's Storm-petrels seasonal timing with respect to migration periods, importance of the area by various life stages, etc. C. Provide information to reflect the likely increased presence of Leach's Storm-petrel in the Project Area in September and October, with reference to Pollet et al. 2014, and potential presence of Leach's Storm-petrel in the Project Area in the winter months, with reference to Pollet et al. 2018. Update the effects assessment to account for the seasonal presence of Leach's Storm-petrel and determine if additional mitigation measures are required.
Equinor Response 15-Nov-19	A/C For clarity, to provide additional information regarding the seasonal timing of Leach's Storm-petrels stranding, the following information will be added to Section 6.2.2.2 of the EIS "Leach's storm-petrel is by far the most numerous species stranding…81 percent of the stranded birds. ***Since most survey days were from June through August, most of the strandings were reported during these months. However, when stranding data from the NL Offshore area are examined, there is a trend showing a large peak in the average number of strandings per day in the last 20 days of September and the first 20 days of October (LGL 2017). During the Equinor Canada 2018 Seabed Survey, a total of 276 Leach's storm-petrels were found stranded on the survey vessel, with 262 Leach's storm-petrels released alive and 14 found dead. However, in one night (Oct 5/6) 255 Leach's storm-petrels were stranded. The weather was foggy on 5 October but clear on 6 October. The increase in strandings in September and October coincides with the abandonment of the nesting colonies by fledglings and adults, the beginning of which is indicated by the earliest published fledging date (10 September) at the Great Island, Witless Bay, nesting colony (Pollet et al. 2019a). It is therefore likely that millions of storm-petrels cross the Atlantic during their migration south. Tracking studies confirm an increased presence of Leach's storm-petrels in the RSA as they cross the Atlantic in a southeast direction during migration to their wintering grounds (Pollet et al. 2014). Some individuals may remain in the vicinity of the RSA for the winter, as suggested by the presence of a tracked individual southeast of Newfoundland (Pollet et al. 2019b)."*** B. As stated in Section 2.1.1 of the EIS (Table 2.1), with the exception of offshore construction and installation which may be seasonal, Project activities will be carried out year-round. Therefore, it is assumed for the purposes of environmental assessment that Project activities will overlap with Leach's storm-petrel spring

	migration (May), nesting (late May to late October), nesting colony abandonment (second week of September to late October) and fall migration (September to December) (Pollet et al. 2014, 2019a). Section 10.2.2.1 - Lighting provides an assessment of potential effects of bird strandings at various times of the year and under varying natural light conditions. Mitigation measures to reduce potential attraction are outlined in Section 10.1.5.2. Updates to the EIS are not required. References: LGL. 2017. Study of Seabird Attraction to the Hebron Production Platform: A Proposed Study Approach. Rep. No. SA1190. Rep. by LGL Limited, St. John's, NL, for Hebron Project, ExxonMobil Properties Inc., St. John's, NL. 30 p. + appendices. ***Pollet, I. L., A. L. Bond, A. Hedd, C. E. Huntington, R. G. Butler, and R. Mauck. 2019a. Leach's Storm-Petrel (Oceanodroma leucorhoa), version 2.0. In: P. G. Rodewald (editor), The Birds of North America, Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bna.lcspet.02.*** ***Pollet, I.L., Ronconi, R.A., Leonard, M.L., and Shutler, D. 2019b. Migration routes and stopover areas of Leach's Storm Petrels Oceanodromoa leucorhoa. Marine Ornithology, 47: 53-63.***

IR-166 **CEAA-78**	**Guideline Ref:** Part 2, Section 7.1.4, Section 7.3.5; Section 7.4, Section 7.5	**EIS Ref:** Section 10.1.5.1
Context/Rationale	Section 6.2.2.2 and Table 10.2 of the EIS provides potential environmental changes in a broad sense, but the potential environmental effect should describe the specific direct and indirect effects to habitat based on the interactions the proponent identified for assessment. The physical presence of vessels is not considered for the FPSO and other construction, HUC, well workover and intervention or decommissioning vessels, but is considered for support survey vessels. This analysis allows the Agency to review Equinor's determination of significance of effects for each project activity under each project phase based on the identified interaction.	
Request **15-Apr-19**	Describe the specific physical habitat features that may change for marine birds and how different vessels are considered as effecting those changes.	
Equinor Response **15-Nov-19**	Table 10.3 in the EIS will be amended to include an interaction under "Change in Avifauna Presence and Abundance (Behavioural Effects)" for vessel presence under all activities, as illustrated below.	

Table 10.3 Potential Project-VC Interactions and Associated Effects: Marine and Migratory Birds

Project Component / Activity	Potential Environmental Effects			
	Change in Habitat Availability and Quality	Change in Food Availability and Quality	Change in Avifauna Presence and Abundance (Behavioural Effects)	Change in Mortality / Injury Levels and Health or Individuals or Populations
CORE BdN DEVELOPMENT ACTIVITIES				
OFFSHORE CONSTRUCTION AND INSTALLATION, AND HOOK-UP AND COMMISSIONING				
Offshore Construction and Installation				
Presence of Vessels			•	
• Lighting	•	•	•	•
• Sound			•	
• Discharges and Air Emissions		•		•
Installation of Subsea Infrastructure (including potential protection)				
Hook-up and Commissioning				
Presence of Vessels			•	
• Lighting	•	•	•	•
• Sound			•	
• Discharges and Air Emissions		•		•
HUC Activities				
• Marine Discharges				
PRODUCTION AND MAINTENANCE OPERATIONS				
Presence of FPSO and Subsea Infrastructure			•	
• Lighting	•	•	•	•

The following amendments will be made to the EIS

Section 10.2.1.1

"For offshore construction and installation and HUC, vessels will be engaged to support Project activities. Potential effects from ***vessel presence***, lighting ***and sound***, as discussed in Section 10.2.2.1, would be similar during construction and installation and HUC, but the effect would be temporary as vessels would be on location for shorter periods of time."

Section 10.2.1.2

"Vessels will be engaged to support HUC activities. Potential effects ***associated with vessel presence***, lighting, sound, discharges and emissions for HUC are assessed ***below*** in Section 10.2.***2***.1."

Section 10.2.2

"As indicated in Table 10.3, the effects assessment in the following sections is focused on ***FPSO presence***, lighting, sound and discharges (e.g. produced water, other waste discharges, air emissions (including flaring)) associated with production and maintenance operations."

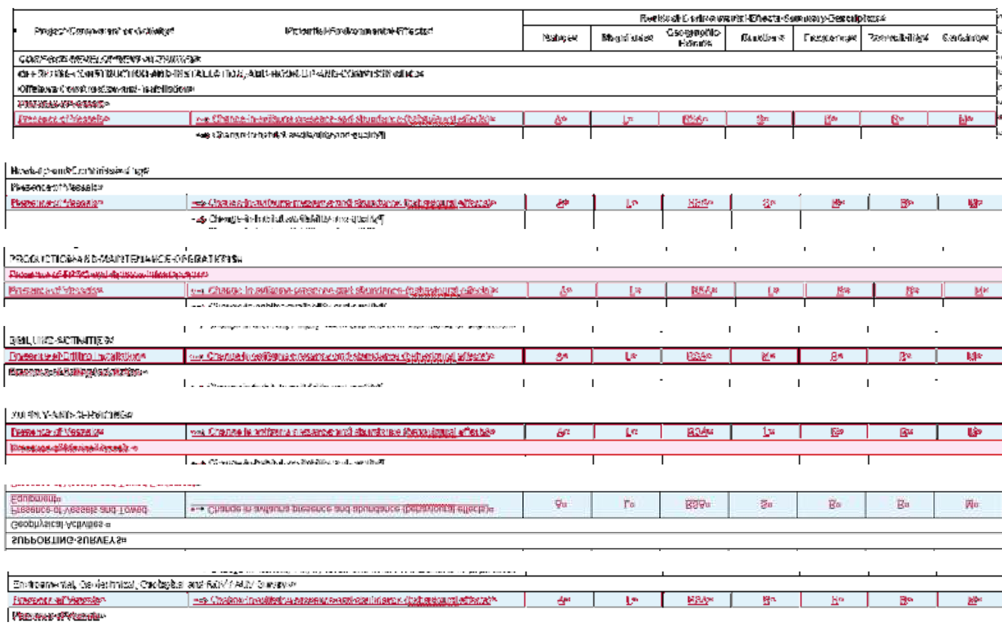
Section 10.2.3.1

"The potential effects of the presence of the drilling installation on Marine and Migratory Birds are similar as assessed in Section 10.2.2.***1.*** However, the duration of drilling is anticipated to be three to five years, while production and maintenance operations have an anticipated duration of 12 to 20 years."

Section 10.2.6

> "Activities associated with decommissioning include, but are not limited to, vessel and helicopter supply and servicing, site preparation, environmental, geotechnical, geological and/or ROV / AUV surveys, which are assessed above in Sections 10.2.***4*** and 10.2.***5***."

Table 10.5 will be amended to include Presence of Vessels, as illustrated in the following:



IR-167 / CEAA-79	Guideline Ref: Part 2, Section 7.1.4, Section 7.3.5; Section 7.4, Section 7.5	EIS Ref: Section 10.2.2.1
Context/Rationale	Section 10.2.2.1 of the EIS states that Atlantic saury is recognized as an important forage fish for marine birds yet they are not mentioned in Section 6.0 of the EIS. In order to better understand the potential adverse environmental effects on migratory birds the evaluation should consider the interaction between migratory birds and the Atlantic saury (fish and fish habitat) in the analysis. As noted in comments in Section 6.0, the biotic interactions are important to the marine ecosystem	
Request 15-Apr-19	A. Provide a relevant food web for the Core BdN Development Area and Project Area to ensure understanding of direct and indirect effects of the Project. B. Update the ecosystem based analysis to include these interactions.	
Equinor Response 15-Nov-19	A. Section 6.1.2 summarizes trophic linkages and community change, Section 6.1.3 summarizes key marine assemblages and Section 6.1.8 describes key fish species in the RSA and Project Area, which are all components of the food web. Section 10.2.2.1 does not describe Atlantic saury as an important forage fish species for marine birds, but rather as one example of several species of fish, squid and other marine species that have vertical diel migrations upon which great-black backed gulls prey (Good 1998). As stated in the EIS "…to forage at night on fish such as Atlantic	

	saury…", the term "such as" indicates that Atlantic saury is an example of prey, and not the primary prey of great black-backed gulls offshore during fall. The text in Section 10.2.2.1 will be amended to read as: "Great black-backed gulls congregate in large flocks at drilling and production platforms offshore NL in late summer post-breeding dispersal and fall migration ***and have been observed to capture fish species,*** such as Atlantic saury, attracted to the surface at night by artificial light emissions from the platforms (Montevecchi et al. 1999; LGL 2017). During the daytime these gulls are more widely dispersed." B. See response to IR-32/Conformity DFO-1 regarding ecosystem approach used in the EIS. The effects of the presence of Project vessels and installations on finfish, such as Atlantic saury, including the attraction of fish by installation/vessel lighting, are assessed in Section 9.2 of the EIS. The assessment in Section 9.2 predicts that the overall increase in hard structures may have localized positive effects on fish abundance and diversity by creating a "reef effect" that aggregates plankton and increases invertebrate colonization, resulting in increased local productivity and food sources that may support higher trophic levels, e.g., finfish and marine birds, and concluded that the Project will not result in significant adverse effects on Marine Fish and Fish Habitat. The potential for such an increase in the abundance of marine fish and invertebrate species, some of which are prey of great black-backed gull, is taken into consideration in the assessment of the potential for a change in food availability and quality cause by the presence of the FPSO, MODUs and project vessels in Section 10.2 of the EIS. References: Good, T. P. 1998. Great Black-backed Gull (*Larus marinus*). *In*: A. Poole and F. Gill (editors), The Birds of North America, No. 330, The Birds of North America, Inc., Philadelphia, PA. 32 p.

IR-168 **CEAA-81**	**Guideline Ref:** Part 2, Section 7.1.4, Section 7.3.5; Section 7.4, Section 7.5	**EIS Ref:** Section 10.2.2.1
Context/Rationale	Section 10.2.2.1 of the EIS notes sound as potentially having an adverse effect on marine bird distribution from airborne sound emissions; however, there were no effects evaluations conducted for this interaction in the EIS. This analysis allows the Agency to review Equinor's determination of significance of effects for each project activity under each project phase based on the identified interaction.	
Request **15-Apr-19**	A. Provide an effects evaluation on changing habitat use by marine and migratory birds due to airborne sound emissions. B. Using the methodology in Table 4.5, describe predicted measurable change in habitat use within or beyond natural variability by marine and migratory birds with potentially confounding effects of attraction and avoidance.	
Equinor Response **15-Nov-19**	A. As noted in response to IR-27 (CEAA-13) sound from helicopters is not an interaction for marine and migratory birds. B. The following text will be added to the final paragraph of Section 10.2.4.2 of the EIS:	

	"Known and observed bird colonies, large aggregations of avifauna, important 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 times outlined in the *Seabird Ecological Reserve Regulations, 2015*. ***This use of existing helicopter routes and operating altitudes, and avoidance of low-level operations will avoid marine bird concentrations by a wide margin and consequently ensure minimal disturbance. As a result, there will be no adverse effects on marine bird habitat use within or beyond natural variability."***

IR-169 **CEAA-82**	**Guideline Ref:** Part 2, Section 7.1.4, Section 7.3.5; Section 7.4, Section 7.5	**EIS Ref:** Section 10.2.2.1; Section 10.2.3.2
Context/Rationale	Section 10.2.2.1 of the EIS states that food and sewage waste are expected to be quickly degraded by bacteria and other biological activity after release. Quick degradation implies there may not be any effect; however other statements in the EIS imply positive and negative direct and indirect effects to marine life for the long term in relation to organic discharges. The conclusion that food and sewage waste will be quickly degraded, but may potentially result in long term effects requires clarification. In Section 10.2.3.2 of the EIS, the discharge of organic wastes from sewage and food are expected to attract marine birds directly or indirectly as forage fish will also be attracted. An assessment of cumulative effects did not take into account this interaction from multiple point sources during simultaneous operations.	
Request **15-Apr-19**	A. In sections 10.2.2.1 and 10.2.3.2 of the EIS provide information from relevant literature, etc. to substantiate the conclusion that food and sewage waste will be degraded by bacteria and other biological activity quickly. B. Evaluate the cumulative effects of waste discharges from FPSOs, MODUs, seismic vessels and associated support vessels, and a shuttle tanker.	
Equinor Response **15-Nov-19**	A. The text in Section 10.2.2.1 will be amended to read as: "Food and sewage waste will be discharged overboard and is expected to be ~~quickly~~ degraded ~~by bacteria~~ after release. ***Grey and black water discharged into the environment may lead to organic enrichment of areas that have either positive or negative effects on local fish and invertebrates (Peterson et al. 1996) and may result in little localized organic enrichment supporting local productivity.*** Effects to fish species upon which avifauna depend may also indirectly affect birds, but such effects are predicted to negligible to low in magnitude and reversible (see Section 9.2.2)." B. As stated in Equinor Canada's response to IR-219/Conformity DFO-4; CEAA, inter-project effects are assessed within each VC. The significance determination in Section 10.5.2 for Marine and Migratory Birds considers all project activities and all discharges, including the potential interaction between different activities and discharges. For clarity, the text in Section 10.5.2 of the EIS will be amended to read as: "***It is predicted that the Project will not result in significant adverse effects on Marine and Migratory Birds. Although Project-related components, activities***	

	and emissions may result in some localized, short- to long-term interactions with Marine and Migratory birds in parts of the LSA, the number of individuals that may be affected, and the temporary and reversible nature of these interactions, means that the Project will not have overall ecological or population-level effects and will not result in detectable decline in overall bird abundance or changes in the spatial and temporal distributions of bird populations within this area. The primary mechanisms of interaction that may have effects on this VC include attraction associated with lighting, increased foraging opportunities, and potential hydrocarbon sheening which are likely episodic and not continuous. While these interactions may lead to increased potential for mortality or injury of individuals, the disturbances are anticipated to be negligible to minor, spatially limited and long-term during production operations. For SAR, the potential for interactions between individuals and these species and the Project is limited, and no identified critical habitat is present in the LSA. The Project will therefore not have implications for the overall abundance, distribution, or health of these species nor its eventual recovery. With the application of mitigation measures, the residual environmental effects on Marine and Migratory Birds are predicted to be not significant. ***Equinor Canada acknowledges that there are uncertainties associated with the number of storm-petrels and other marine and migratory birds stranding on installations and vessels in offshore Newfoundland due to the lack of lack of systematic protocols to search for and document bird strandings. Therefore, the determination of significance has been reached with a moderate level of confidence based on the nature and scope of the Project, knowledge about the existing environment within the LSA and RSA, and current understanding of the effects of similar projects on the VC and relevant, planned mitigation measures."*** References: ***Peterson, C.H., M.C. Kennicutt II, R.H. Green, P. Montagna, D.E. Harper, Jr, E.N. Powell, and P.F. Roscigno. 1996. Ecological consequences of environmental perturbations associated with offshore hydrocarbon production: A perspective on long-term exposures in the Gulf of Mexico. Canadian Journal of Fisheries and Aquatic Sciences, 53(11): 2637-2654.***

IR-170 **CEAA-83**	**Guideline Ref:** Part 2, Section 7.1.4, Section 7.3.5, Section, 7.4, Section 7.5	**EIS Ref:** Section 10.2.2.2; Section 15.3.3; Table 15.7
Context/Rationale	In Section 10.2.2.2 of the EIS, the PNEC of oil in water of 70.7 ug/L relates to toxicity testing and risk assessment on fish, mollusk, polychaete, and crustacean test animals. This PNEC does not appear to apply to marine birds unless an exposure analysis through modeling was performed. The presence of any oil sheen may cause adverse environmental effects on marine birds. In Section 15.3.3 of the EIS, oil in produced water discharge and the occurrence of sheens is not included in Table 15.7 that lists other production projects and their effects. This information is needed to assess cumulative effects of produced water sheens on seabird populations.	

Request 15-Apr-19	A. Provide the zone of influence of produced water with an oil in water concentration of 30 mg/L to evaluate the potential for marine bird exposure to sheens. B. Include a cumulative effects analysis of produced water oil sheens from the existing four production platforms on marine and migratory birds. C. Clarify, and provide a rationale for why the PNEC of 70.7 ug/L oil in water was used as a threshold for marine birds. D. Assess the potential for attracting birds to the FPSO and MODUs by lights and food wastes that may result in their exposure to produced water sheens.
Equinor Response 15-Nov-19	A/C It must be noted that not all sheens are caused by produced water discharges. As stated in response to IR-279/DFO-133, produced water plume modelling was not a requirement of the EIS Guidelines and the scope of the modelling was based on the experience and professional judgement of the EIS team. As indicated in response to IR-275/ECCC-44, produced water modelling was updated to include a worst-case discharge of 50,000 m^3/d. Upon review of the EIS, the use of the PNEC was not applicable for Marine and Migratory Birds, therefore the text in Section 10.2.2.2 of the EIS will be amended to incorporate the revised produced water modelling and will read as "Based on modelling of produced water discharge scenarios undertaken for the Project (see summary in Section 9.2.2.2 and detailed report in Appendix J, Deblois 2019), the produced water plume was predicted to be of highest concentration within ***100 m of the discharge source and within the upper 10 m of the water column. For the worst-case scenario of 50,000 m³/d release, the modelling predicts decreasing OIW concentrations with increasing distance from the release site and decreasing concentrations with increasing depth. The Dose-Related Risk and Effects Assessment Model (DREAM) concentrates on underwater releases, so that surface processes are of secondary importance (EIS Appendix J, DeBlois 2019). OIW concentrations can change due to oil droplets rising to the surface to form a slick, and DREAM incorporates this phenomenon. Although the areal distributions of OIW concentrations are modelled and presented (Appendix D in DeBlois 2019), the distributions of slicks are not modelled.*** Oil at or near the surface has the greatest potential to affect the plumage of marine birds. ***Produced water sheens reported in the Newfoundland offshore were associated with OIW concentrations of 4 to 137 mg/L (~ppm) (Morandin and O'Hara 2016). The results of the produced water plume dispersion modelling suggest that the highest OIW concentrations would be in close proximity of the FPSO, it is therefore assumed that the likelihood of enough oil rising to the surface to form a sheen could be higher near the FPSO.*** ***As discussed above, gulls are the most abundant of those species attracted to the FPSO. Unlike Leach's storm-petrel, the next most commonly attracted species, gulls regularly come in contact with the water around the FPSO whether resting on the surface or foraging for fish. Gulls would be at greatest risk of encountering a sheen from produced water during fall because their abundance around production and drilling platforms peaks at that time. The risk would be lower during winter and lowest during spring and summer when gulls are rarely seen in Jeanne d'Arc and Orphan Basins.*** It must also be noted that not all sheens are caused by produced water discharges. Produced water will be treated using best treatment practices that are

commercially available and economically feasible before discharge to the marine environment."

Effects of sheens on marine and migratory birds is presented in Section 10.2.2.2 of the EIS.

B. The following amendments will be made to Section 15.3 of the EIS.

Table 15.7:

Table 15.7 Marine and Migratory Birds: Other Projects and Activities and their Environmental Effects

Project / Activity	Potential Effects on this VC	Spatial and Temporal Considerations
Hibernia	• Change in habitat availability and quality • Change in food availability and quality • Change in avifauna presence and abundance (behavioural effects) • Change in mortality / injury levels and health of individuals or populations	• Current or potential effects are similar to those that could be associated with the Project and are primarily associated with possible implications for mortality / injury levels and habitat availability / quality due to attraction of night-flying birds to artificial lighting (including flares) and exposure/attraction to emissions and discharges from platforms and vessels (Ellis et al. 2013). There are also potential disturbance effects from vessel and aircraft traffic. • Non-routine discharges may contribute to a change in mortality / injury levels, but these are not anticipated. • Sheening may contribute to a change in mortality/injury levels. • Routine discharges will be managed in consideration of the guidelines and in compliance with regulations. and are unlikely to cause measurable change in mortality / injury, presence and abundance or food availability and quality. There may be a change in food availability due to discharges of organic waste. • Interactions with the VC are anticipated to be confined to within approximately 5 km (Poot et al. 2008) to 16 km (Rodríguez et al. 2014, 2015) of the source for lighting attraction effects. • Operational discharges and effects of vessel and aircraft traffic are more localized (Fraser et al. 2006; Rojek et al. 2007; Hoang 2013; Morandin and O'Hara 2016). • The majority of strandings reported by operators occur in September and October, corresponding with the departure of Leach's storm petrel fledglings from
Terra Nova	• Change in habitat availability and quality • Change in food availability and quality • Change in avifauna presence and abundance (behavioural effects) • Change in mortality / injury levels and health of individuals or populations	
White Rose and Extension Project	• Change in habitat availability and quality • Change in food availability and quality • Change in avifauna presence and abundance (behavioural effects) • Change in mortality / injury levels and health of individuals or populations	
	• Change in habitat availability and quality	

Section 15.3.4:

"Potential interactions with, and effects on, Marine and Migratory Birds as a result of the Project and other projects and activities in the region relate primarily to attraction effects associated with artificial lighting. ~~While there may also be interactions associated with sound and the discharge of waste materials from these offshore activities, the effects are predicted to be not significant, and therefore the cumulative effects assessment will focus on effects of lighting and attraction.~~ Section 10.2.2 provides a detailed summary of the existing and available literature on the potential effects of offshore lighting on marine-associated avifauna.

…The result may be the potential for additional individuals to interact with artificial lighting, or the same individuals to interact with multiple offshore petroleum production projects.

"Waste discharges from the four existing petroleum production projects in the RSA (Hibernia, Terra Nova, White Rose and Hebron) may contribute to environmental effects on marine and migratory birds. As discussed in

	Section 10.2.2.2, surface sheening may occur during relatively calm water conditions. Experience with existing production facilities (Fraser et al. 2006; Morandin and O'Hara 2016) demonstrate a localized geographic extent of sheen formation. Similarly, zones of influences associated with other discharges, including food and sewage wastes, are localized to the installations. Given the distance between the Project and the other offshore petroleum production projects the interactions with sheening and other discharges are not anticipated to overlap spatially. However, the long-distance movements of some bird species have the potential for individuals to be affected by multiple producing projects. The foraging trips of nesting Leach's storm-petrels between the Witless Bay nesting colony and foraging areas in Flemish Pass suggest the potential for effects from multiple producing projects. However, Leach's storm-petrel feeds primarily on prey species that are present in deeper waters, and therefore are not likely present in the relatively shallow waters surrounding the existing production facilities. While some black-legged kittiwakes and great black-backed gulls may pass through the zones of influence of multiple production installations during their spring and fall migration between coastal nesting colonies to and their offshore staging and wintering areas, the number of individuals likely exposed to all the producing operations is likely small, therefore population effects are unlikely. Cumulative effects associated with sheening and waste are therefore unlikely. Potential interactions with marine birds as a result of other types of projects and activities in the RSA (i.e., projects and activities other than those associated with offshore petroleum production) will generally entail localized and short-term disturbances at any one location and time…" D. The attraction of birds due to lighting and food wastes is addressed in Section 10.2.2.2 of the EIS. The effects of sheens on Marine and Migratory Birds is addressed in Section 10.2.2.2. Additional updates to the EIS are not required.

IR-171 **CEAA-84**	**Guideline Ref:** Part 2, Section 7.1.4, Section 7.3.5, Section, 7.4, Section 7.5	**EIS Ref:** Section 10.2.3, Section 10.2.3.1
Context/Rationale	Cumulative effects Section 10.2.3 and 10.2.3.1 of the EIS did not consider simultaneous operations in the field including two MODUs, the FPSO, shuttle tanker, various support vessels and seismic vessels.	
Request **15-Apr-19**	A. Provide a rationale for the contrary conclusions "Interactions associated with presence are the same as those for the FPSO and are considered in terms of the cumulative nature of the effect with more than one installation active during the Project." Followed by "[T]he cumulative effects of lighting of the FPSO concurrently with one to two drilling installations is uncertain as mortality rates associated with individual installations are not completely understood." B. Provide a cumulative effects assessment of simultaneous operations within the Project. C. Identify data and knowledge gaps throughout the EIS	
Equinor Response **15-Nov-19**	A. There is no contradiction between the two sentences as noted by the reviewer. The text "The cumulative effects of lighting of the FPSO concurrently with one to two drilling installations is uncertain as mortality rates associated with individual	

	installations are not completely understood" provides information regarding the certainty of prediction of effects. For clarity, the following text will be included in Section 10.2.3: "Interactions associated with ***drilling installation*** presence are the same as those for the FPSO (see Section 10.2.2.1). ***The 16 km zone of influence is defined for the Project area and not limited to a single installation, and therefore assumes more than one installation in operation within the Project area."*** ~~and are considered in terms of the cumulative nature of the effect with more than one installation active during the Project"~~ B. Refer to responses in IR-169/CEAA-82 and IR-219/Conformity DFO-4. C. EIS conclusions are evidence based, using all available information. This evidence is discussed in Section 10.2.2.1 (Presence of the FPSO, Lighting). Uncertainties associated with predictions are noted in the EIS.

IR-172 **CEAA-86**	**Guideline Ref:** Part 2, Section 7.1.4, Section 7.3.5, Section, 7.4, Section 7.5	**EIS Ref:** Section 10.2.4.1
Context/Rationale	In Section 10.2.3.3 of the EIS, an effects rating of low in magnitude is provided; however, since natural variability in marine birds was not provided, it is not clear how Equinor determined the rating was low. Also, it appears that only Leach's storm-petrels were considered without the rationale for why this was appropriate.	
Request **15-Apr-19**	A. Provide the rationale for the effects ratings and moderate confidence level on marine birds. B. Explain why only Leach's Storm-petrels are considered in the project effects on marine and migratory birds.	
Equinor Response **15-Nov-19**	A. Information regarding confidence levels in predictions is addressed in responses to IR-37/CEAA-111, IR-143/ECCC-24 and IR-182/ECCC-33. For clarity, the following text will be added Section 6.2.2.2 of the EIS regarding natural variability. "CWS records for Leach's Storm-petrel colonies in eastern NL are provided in Table 6.35. This species is designated globally Vulnerable by the IUCN (see Section 6.2.4) (Birdlife International 2018). ***The natural variability in mortality and population size in Leach's storm-petrel in the Northwest Atlantic (Leach's storm-petrel) is poorly understood (Wilhelm et al. 2019). Predation at nesting colonies is believed to be the major cause of mortality (Stenhouse and Montevecchi 1999; Bicknell et al. 2009; Pollet et al. 2019; Pollet and Shutler 2019). High levels of mercury borne by these birds, and important shifts in demersal and pelagic food webs in the northwest Atlantic have also been identified as potentially important sources of mortality and potentially population decline (Bond and Diamond 2009; Head and Pepin 2010; Buren et al. 2014; Burgess et al. 2016 in Pollet et al. 2019; Pollet et al. 2016)."*** B. Equinor Canada disagrees with reviewer's assertion that "only Leach's Storm-petrels are considered in the project effects on Marine and Migratory Birds". Section 6.2 identifies the presence of many marine and migratory bird species in the Project Area and LSA. These species are considered throughout Chapter 10: for example, "observed densities of dovekie, northern fulmar, shearwater, and storm-petrel species	

on the Scotian Shelf were lower within 10 km of platforms compared to regions further away, suggesting some avoidance of platforms by certain species, although the effects of habitat preferences were not assessed (Amec 2011);" "great black-backed gulls congregate in large flocks at drilling and production platforms offshore NL in late summer post-breeding dispersal and fall migration and have been observed to capture fish species such as Atlantic saury, which is attracted to the surface by artificial light emissions from the platforms (Montevecchi et al. 1999; LGL 2017). Diving thick-billed murres are attracted to underwater lights during the Arctic polar night, but dovekies are not, suggesting that some diving marine bird species could potentially be attracted to the FPSO at night for foraging opportunities (Ostaszewska et al. 2017)."

The potential for attraction of marine and migratory birds to lighting and flaring leading to potential for reduced fitness or mortality has been identified by ECCC-CWS during consultation as the main source of potential effects of offshore oil production projects on this VC (EIS Section 10.1.5.1). Because most strandings arising from attraction to lighting/flares are of Leach's storm-petrels and because this species' population in the northwest Atlantic is vulnerable due to its declining size, ECCC-CWS requested that the potential effects of the Project on this species be addressed in this EIS (Section 10.1.5.1). As a result, this EIS addresses the potential effects of the Project on Marine and Migratory Birds with an emphasis on Leach's storm-petrel.

For clarity, the following text will be added to Section 10.2.2.1:

> ***"As discussed above, Leach's storm-petrel has been found to be the most common species to interact with oil exploration and production facilities in the NL offshore area. As identified in Section 10.1.5.1, regulatory agencies and stakeholders identified Leach's storm petrels as a species meriting heightened focus regarding attraction interactions.*** ~~The greatest potential for interaction between artificial light emissions from the production and drilling installations and Marine and Migratory Birds is in the attraction of Leach's storm-petrels~~. As discussed in Section 6.2.2.2, this species feeds primarily in the deep waters off the continental shelf."

In addition, the following edit will be made to text in Section 10.2.2.1.

> "The decline is believed to be attributable to a number of factors including predation, ingestion of marine contaminants (e.g., mercury), collisions and strandings due to attraction to lighted structures, contact with hydrocarbons ***and shifts in pelagic food webs*** (BirdLife International 2018)."

References (Chapter 6):

Bicknell, T. W. J., J. B. Reid, and S. C. Votier. 2009. Probable predation of Leach's Storm-Petrel Oceanodroma leucorhoa eggs by St Kilda Field Mice Apodemus sylvaticus hirtensis. Bird Study, 56: 419-422.

Bond, A. L., and A. W. Diamond. 2009. Mercury concentrations in seabird tissues from Machias Seal Island, New Brunswick, Canada. Science of the Total Environment, 407: 4340-4347.

Buren, A. D., M. Koen-Alonso, P. Pepin, F. Mowbray, B. Nakashima, G. Stenson, N. Ollerhead, and W. A. Montevecchi. 2014. Bottom-up regulation of capelin, a keystone forage species. PLoS One: http://dx.doi.org/10.1371/journal.pone.0087589.

Burgess, N., A. Hedd, I. L. Pollet, R. A. Mauck, A. W. Diamond, C. M. Burke, L. A. McFarlane Tranquilla, W. A. Montevecchi, M. Valliant, S. I. Wilhelm, and G. J. Robertson. 2016. Differences in mercury exposure of breeding Leach's storm-petrels related to their foraging patterns in the Northwest Atlantic Ocean. 7th World

	Congress of the Society of Environmental Toxicology & Chemistry Conference, 6–10 Nov 2016, Orlando, Florida. ***Head, E. J. H., and P. Pepin. 2010. Spatial and inter-decadal variability in plankton abundance and composition in the Northwest Atlantic (1958–2006). Journal of Plankton Research, 32: 1633-1648.*** ***Pollet, I. L., and D. Shutler. 2019. Effects of Great Horned Owls (Bubo virginianus) on a Leach's Storm-Petrel (Oceanodroma leucorhoa) population. Wilson Journal of Ornithology, 131: 152-155.*** Pollet, I. L., M. L. Leonard, N. J. O'Driscoll, N. M. Burgess, and D. Shutler. 2016. Relationships between blood mercury levels, reproduction, and return rate in a small seabird. Ecotoxicology, 26: 97-103. ***Pollet, I. L., A. L. Bond, A. Hedd, C. E. Huntington, R. G. Butler, and R. Mauck. 2019. Leach's Storm-Petrel (Oceanodroma leucorhoa), version 2.0. In: P. G. Rodewald (editor), The Birds of North America, Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bna.lcspet.02*** ***Stenhouse, I. J., and W. A. Montevecchi. 1999. Indirect effects of the availability of capelin and fishery discards: Gull predation on breeding storm-petrels. Marine Ecology Progress Series, 184: 303-307.*** ***Wilhelm, S. I., A. Hedd, G. J. Robertson, J. Mailhiot, P. M. Regular, P. C. Ryan, and R. D. Elliot. 2019. The world's largest breeding colony of Leach's Storm-petrel Hydrobates leucorhous has declined. Bird Conservation International, early view online: https://doi.org/10.1017/S0959270919000248.***

IR-173 **CEAA-87**	**Guideline Ref:** Part 2, Section 7.1.4, Section 7.3.5, Section, 7.4, Section 7.5	**EIS Ref:** Section 10.2.4.1
Context/Rationale	In Section 10.2.4.1 of the EIS, the effects on marine birds from an increase in project vessel traffic from supply and servicing vessels and a shuttle tanker is compared against vessel traffic within the entire eastern Newfoundland region and not against existing petroleum related traffic along defined routes not considers that there is no existing dedicated route to the project areas.	
Request **15-Apr-19**	In Section 10.2.4.1 of the EIS provide a rationale for the description of effects on marine birds from an increase in project vessel traffic along the proposed route but based only on the entire eastern Newfoundland region and not the LSA or the RSA.	
Equinor Response **15-Nov-19**	Section 2.6.1.2 provides an overview of the Project's contribution to vessel traffic in the RSA, based on transit statistics provided by the St. John's Port Authority representing all potential marine traffic offshore eastern Newfoundland transiting through the St. John's Harbour. This includes all supply and servicing vessels. The statement in Section 10.2.4.1 "This volume of vessel traffic associated with Core BdN Development activities represents a negligible contribution to the overall vessel traffic off eastern Newfoundland" is valid (refer to Section 2.6.1.2). Section 10.2.4.1 recognizes that, there will be an increase in vessel traffic. However, due to the transient nature and short-term presence of supply and servicing vessels in the LSA, including the vessel traffic route, Marine and Migratory birds will likely not be affected. The effects assessment is complete. Updates to the EIS are not required.	

IR-174 **CEAA-88**	**Guideline Ref:** Part 2, Section 7.1.4, Section 7.3.5, Section, 7.4, Section 7.5	**EIS Ref:** Section 10.2.5.3
Context/Rationale	Section 10.2.5.3 of the EIS, states "the residual environmental effects on Marine and Migratory Birds are predicted to be adverse, negligible in magnitude, within the RSA due to the potential effects of lighting on Leach's storm-petrel breeding populations, short-term in duration, occurring sporadically, and reversible." This summary of effects appears to only consider adults and not the fledging juveniles which the proponent noted in the EIS for high incidents with offshore vessels and infrastructure. The magnitude of effects are different between geophysical and other surveys vessels but compares the magnitude of effects to an FPSO.	
Request **15-Apr-19**	A. Provide the rationale for summarizing effects from surveying vessels only addressing Leach's Storm-petrel breeding populations and not other life stages of this species. B. Review and clearly explain the difference in magnitude of effects between various project vessels for accuracy.	
Equinor Response **15-Nov-19**	A. As stated in Section 10.2.2.1 of the EIS the number of Leach's storm-petrels stranding on oil platforms and geophysical exploration vessels in the Newfoundland offshore peaks at the time of year when storm-petrels are fledging and nesting adults are abandoning Newfoundland nesting colonies. Therefore, it is these life-stages that are most likely to be affected. B. The text in the Section 10.2.5.3 will be amended to read as: **Geophysical Activities** "With the application of mitigation measures, the residual environmental effects on Marine and Migratory Birds are predicted to be adverse, negligible in magnitude, within the RSA due to the potential effects of lighting on Leach's storm-petrel ~~breeding~~ populations, short-term in duration, occurring sporadically, and reversible. This prediction is made with a moderate level of confidence."	

IR-175 **CEAA-89**	**Guideline Ref:** Part 2, Section 7.1.4, Section 7.3.5, Section, 7.4, Section 7.5	**EIS Ref:** Section 9.1.5.1, Section 10.1.5.1, Section 11.1.5.1, Section 12.1.5.1, Section 13.1.5.1; Section 14.1.5.1; Section 15.2.3
Context/Rationale	EIS Sections 9.1.5.1, 10.1.5.1, 11.1.5.1, 12.1.5.1, 13.1.5.1, 14.1.5.1 and 15.2.3 and their associated tables that presents potential environmental effects by changes for each project phase and each activity. However, the effects analyses do not provide the same information or consideration. Measurable change in habitat availability, change in food availability, change in species distribution and abundance, changes in mortality or changes in use within or beyond natural variability were not discussed in that context in the effects analyses. The effects assessment did not consider ecological level effects in the ecosystem methodology as stipulated in the EIS guidelines and committed to in Section 4 of the EIS "Although the EIS provides individual environmental effects assessments for each VC (Chapters 9 to 14), it is done with consideration of the interactions and interrelationships between these environmental components through a holistic, ecosystem-based approach."	

	Mitigation measures were not always described so it is unclear whether in some instances whether mitigation measures will be applied or needed to ensure no significant adverse effects. Natural variability information in Section 6 is not discussed. This information forms the basis of analysis that allows the Agency to review Equinor's determination of significance of effects for each project activity under each project phase based on the identified interaction.
Request 15-Apr-19	Update the effects analysis in the EIS Sections 9, 10, 11, 12, 13, 14 and 15 with substantiated conclusive statements rationale and evidence to substantiate conclusive statements on residual effects using the same identified changes in the interaction tables., where relevant, on measureable changes in VCs resulting from each interaction with project activity under each project phases.
Equinor Response 15-Nov-19	Information regarding mitigations is addressed in response to IR-101/Conformity DFO-3. Information regarding the ecosystem approach is provided in response to IR-32/Conformity DFO-1 Reponses to IR-144/DFO(21, 109, 145, 150, 153, 162) provides clarification regarding the relationships between Project activities and VC interactions. Section 4.3 of the EIS Guidelines state "*except where specified by the Agency, the Proponent has the discretion to select the most appropriate the methods to compile and present data, information and analysis in the EIS as long as they are justifiable and replicable.*" The EA methodology used in the BdN EIS is the same approach used in the recently approved Flemish Pass Drilling EIS (Statoil, 2017). Where it is stated in the EIS, for instance in Section 9.2.1.3 "…the residual environmental effects on Marine Fish and Fish Habitat…" the reference to environmental effects means those effects identified in Section 9.1.5.2. The same principle applies, with the necessary modifications, to the other VC Chapters. However, for clarification, the following text will be added to Section 4.3.3 of the EIS: ***"Each VC chapter provides a table identifying the Project interactions and associated potential effects by Project activity/phase.*** The environmental effects assessment ***by Project phase/activity*** for each VC concludes with a ***summary statement characterizing the*** predicted residual ***(after the application of the relevant mitigation measures)*** environmental effects of the Project ***by reference to the environmental effects descriptors (see Table 4.5). The evaluation of*** significance of these based on the VC-specific significance definitions developed and presented at the beginning of the VC chapter. Key sources of uncertainty or assumptions made in defining and determining environmental effects significance are also presented and justified where relevant. If significant effects are predicted, the likelihood of their occurrence is discussed."

IR-176 **CEAA-90**	**Guideline Ref:** Part 2, Section 7.1.4, Section 7.3.5, Section, 7.4, Section 7.5	**EIS Ref:** Section 9.1.5.1, Section 10.1.5.1, Section 11.1.5.1, Section 12.1.5.1, Section 13.1.5.1; Section 14.1.5.1; Section 15.2.3
Context/Rationale	The significance ratings in Section 10.5.2 are not aligned with Table 4.5 and schedule of project activities.	

Request 15-Apr-19	Revise the effects analysis in Section 10.5.2 of the EIS to align with the effects descriptors in Table 4.5 or reconsider the definitions in the table.
Equinor Response 15-Nov-19	As described in response to IR-152/CEAA-75, the duration of effect is not the duration of project activities. See response to IR-182/ECCC-33 regarding proposed amendments to Section 10.5.2

IR-177 **ECCC-26**	**Guideline Ref:** Part 2, Section 7.1.4	**EIS Ref:** Section 10.1.5.2, Section 10.5.1, Section 18.4.2
Context/Rationale	Sections 10.1.5.2, 10.5.1 of the EIS state "With regards to stranded seabirds the following will be undertaken: Routine searches for stranded seabirds will be conducted on the FPSO, drilling installation and stand-by vessels (SBVs). Equinor Canada will develop a protocol for searches for stranded seabirds in consultation with Environment and Climate Change Canada (ECCC) Canadian Wildlife Service (CWS) applicable to the Project." Appropriate programs and protocols for the collection and release of stranded seabirds will be implemented. The program will consider the following existing protocols: ECCC-CWS' "Procedures for handling and documenting stranded birds encountered on infrastructure offshore Atlantic Canada" (ECCC 2017) and Williams and Chardine "The Leach's storm-petrel – General Information and Handling Instructions (no date, adapted in Appendix I of EC 2015). Table 10.5 – Environmental Effects Assessment Summary: Marine and Migratory Birds (including SAR) – Core BdN Development) Table 10.6 – Environmental Effects Assessment Summary: Marine and Migratory Birds (including SAR) – Potential Future Development) In Section 18.4.2 of the EIS it states "Routine searches for stranded seabirds will be conducted on the FPSO, drilling installation and SBVs. Equinor Canada will develop a protocol for searches for stranded seabirds in consultation with ECCC-CWS applicable to the BdN Development. Personnel on board the FPSO and/or drilling installation and SBVs tasked with daily searches will be trained in handling and reporting of stranded and/or deceased seabirds. If a Species at Risk is found on the FPSO, drilling installation or SBVs, a report will be sent to CWS for identification. In addition to the annual report summarizing stranded and/or seabird handling in accordance with the Seabird Handling Permit, the annual report will also include a summary of seabird observations from the Project." ECCC has advised that until an adequate estimate of strandings and mortality at offshore infrastructure is obtained, there is uncertainty as to the level of effect on birds. Information is lacking concerning how the proponent would implement search protocols and document search effort for stranded migratory birds. The EIS refers to protocols for handling stranded birds, but handling protocols are distinct from systematic searching protocols. Systematic deck searches for stranded birds undertaken by trained observers are more effective as mitigation than opportunistic searches. These systematic searches should occur at least daily (preferably at dawn), with search efforts documented and observations recorded (including notes of efforts when no birds are found). ECCC has expertise in this	

	area and is available to be consulted in the development of systematic monitoring protocols.
Request 15-Apr-19	Discuss the technical and economic feasibility of applying the following mitigation measure and discuss whether it would alter the effects analysis on migratory birds: “Systematic deck searches for stranded birds undertaken by trained observers. These systematic searches should occur at least daily (preferably at dawn), with search efforts documented and observations recorded (including notes of efforts when no birds are found). “
Equinor Response 15-Nov-19	Equinor Canada has committed in the EIS to developing a search protocol for stranded birds, as the reviewer has quoted in the Context/Rationale section above. Specifically, Section 10.1.5.2 provides the following mitigation regarding stranded birds “Routine searches for stranded seabirds will be conducted on the FPSO, drilling installation and stand-by vessels (SBVs). Equinor Canada will develop a protocol for searches for stranded seabirds in consultation with Environment and Climate Change Canada (ECCC) Canadian Wildlife Service (CWS) applicable to the Project.” Details on the protocol are not provided, as noted; however, as stated in the EIS, Equinor Canada will work with ECCC CWS to develop the protocol. Equinor Canada does not agree with the reviewer’s statement that “The EIS refers to protocols for handling stranded birds, but handling protocols are distinct from systematic searching protocols.” The EIS refers to both – developing protocols for searches (to be developed in consultation with ECCC) and implementing handling protocols following established guidance. Equinor Canada is committed to working with ECCC-CWS to design the search protocol that is applicable to the BdN Development, as stated in Table 18.2 Item 38. In addition, as stated in Section 10.6, Equinor Canada is committed to a seabird observation program, which may involve the use of technology. Similarly, until design is final, and in consideration of technological advancements, the stranded bird search protocol may also include technology. Therefore, when Project design is complete, the stranded bird search protocol and seabird observation program will be developed in consultation with ECCC-CWS. The mitigation listed in Section 10.1.5.2, Tables 10.5 and 10.6, Table 18.2) will be revised to read as: “Routine searches for stranded seabirds will be conducted on the FPSO, drilling installation and stand-by vessels (SBVs). Equinor Canada will develop a protocol for ***systematic*** searches for ***and recovery of live seabirds***, and ***documentation of*** stranded seabirds in consultation with Environment and Climate Change Canada (ECCC) Canadian Wildlife Service (CWS) applicable to the Project.”

IR-178	**Guideline Ref:** Part 2, Section 7.4	**EIS Ref:** Section 10.1.5.2; Section 10.5.1
ECCC-28		
Context/Rationale	In Section 10.1.5.2 of the EIS “Flaring on the FPSO will not occur during routine operations and excess gas will be reinjected into the reservoir.” In accordance with the C-NLOPB’s *Measures to Protect and Monitor Seabirds in Petroleum-Related Activity in the Canada-Newfoundland and Labrador Offshore Area,* the proponent should notify the C-NLOPB of any plans to flare at least 30 days in advance of flaring to determine whether this activity would occur during a period of migratory bird vulnerability and how the proponent plans to prevent harm to migratory birds.	

	In addition to avoiding nighttime flaring, ECCC advises that avoiding flaring during peak storm-petrel fledging (mid-September to mid-October) and during the day when visibility is low due to fog.
Request 15-Apr-19	In Section 10.1.5.2 of the EIS, discuss the economic and technical feasibility of the following mitigation measures and discuss whether it would alter the effects analysis on migratory birds: The Canada-Newfoundland and Labrador Offshore Petroleum Board will be notified at least 30 days in advance of non-emergency flaring to have the Board determine whether flaring would occur during a period of migratory bird vulnerability, and the proponent should detail how it plans to prevent harm to migratory birds. Number of flaring events will be minimized to the extent feasible during nighttime and poor weather conditions, as well as during periods of bird vulnerability.
Equinor Response 15-Nov-19	It is the understanding of Equinor Canada that the C-NLOPB's *Measures to Protect and Monitor Seabirds in Petroleum-Related Activity in the Canada-Newfoundland and Labrador Offshore Area* is for <u>exploration and delineation drilling activities, not production operations</u>, as it states "To mitigate the impacts to seabird populations from flaring operations in exploration and delineation drilling, including well testing, industry operators are required to notify the C-NLOPB of plans to flare. The Board would then consult with ECCC-CWS to determine a safe timeline to proceed to minimize impact on migratory birds". As stated in the Section 2.7.1.4 of the EIS and clarified in response to IR-9/CEAA-4, routine flaring will not occur during the Project, flaring will only occur during non-routine flaring events, including safety flaring and flaring during turn-around/maintenance activities. Notification in advance of safety flaring events is not feasible nor practicable, as safety events cannot be scheduled. As indicated in response to IR-9/CEAA-4, a flaring and venting plan will be approved by the C-NLOPB as per the Operations Authorization approval process. The plan will outline planned flaring events (i.e., those that are defined as non-routine in the EIS). It is Equinor Canada's understanding that the flaring and venting plan is also required to be submitted annually for approval. Flaring during safety events or turnaround/maintenance activities cannot be limited to daytime hours and periods of good visibility. As indicated in the EIS and further clarified in response to IR-6/CEAA-4, the duration of non-routine flaring during start-up/shut-down and during maintenance/turn-around activities "will typically be of short duration and will be governed by Equinor best practices to reduce overall flaring duration."

IR-179	**Guideline Ref:** Part 2, Section 7.3.5	**EIS Ref:** Section 10.2.2.1
ECCC-29		
Context/Rationale	In Section 10.2.2.1 of the EIS "There are no published studies on seabird mortality on offshore platforms." This is an incorrect statement. While there may not be any studies that quantify the amount of seabird mortality, there are certainly studies that indicate that seabirds are stranded on offshore platforms (alive and dead). The proponent should reference Ronconi et al. 2015 (and associated references) and correct this statement. See also Ellis et al. 2013, which is specific to the Canadian offshore industry.	

	Ronconi, R.A., Allard, K.A., and Taylor, P.D. (2015). Bird interactions with offshore platforms: Review if impacts and monitoring techniques. Journal of Environmental Management. 147: 34-45. Ellis, J.I., Wilhelm, S.I., Hedd, A., Fraser, G.S., Robertson, G.J., Rail, J-F., Fowler, M., Morgan, K.H. (2013). Mortality of Migratory Birds from Marine Commercial Fisheries and Offshore Oil and Gas Production in Canada. Conservation and Ecology. 8(2): 4 http://dx.doi.org/10.5751/ACE-00589-080204
Request 15-Apr-19	In Section 10.2.2.1 of the EIS update the effects analysis on migratory birds to include consideration of the information summarized in Ellis et al. 2013 and Ronconi et al. 2015.
Equinor Response 15-Nov-19	The effects assessment considers the information provided in Ellis et al. 2013 and Ronconi et al. 2015. Section 10.2.2.1 provides a discussion of the primary literature that Ellis et al. (2013) and Ronconi et al. (2015) summarize in their review papers, rather than relying solely on the summaries presented in those two literature reviews. In addition, conclusions drawn by Ronconi et al. (2015) are cited in seven places and conclusions drawn by Ellis et al. (2013) are cited in five places in Section 10.2.2.1. However, to provide clarity, the text in Section 10.2.2.1 will be amended to read: “There are no published studies ***that have systematically quantified*** seabird mortality on offshore platforms ***(Ellis et al. 2013; Ronconi et al. 2015)***.”

IR-180 **ECCC-30**	**Guideline Ref:** Part 2, Section 7.3.5, Section 7.6.3	**EIS Ref:** Section 10.5.1, Section 15.3.2
Context/Rationale	In Section 10.5.1 of the EIS, Table 10.5 “Based on the nature and characteristics of the Project and the existing environment for this VC within the LSA and RSA, and with the planned implementation of mitigation, the Project is not likely to result in significant residual adverse effects on Marine and Migratory Birds.” In Section 15.3.2 of the EIS Table 10.6 “Based on the nature and characteristics of the Project and the existing environment for this VC within the LSA and RSA, and with the planned implementation of mitigation, the Project is not likely to result in significant residual adverse effects on Marine and Migratory Birds.” “Although Project-related components, activities, and discharges may result in some localized, long-term interactions with marine-associated avifauna in parts of the LSA throughout the life of the Project, including bird attraction to offshore lighting and other components, the number of individuals that may be affected, and the temporary and reversible nature of these interactions, means that the Project will not have overall ecological or population-level effects, and particularly, will not result in a detectable decline in overall bird abundance or changes in the spatial and temporal distribution of bird populations within this area.” “As described in Chapter 10, based on the nature and characteristics of the Project, the existing environment for this VC within the LSA and RSA, and the planned implementation of mitigation, the Project is not likely to result in significant residual adverse effects on Marine and Migratory Birds.” Given the references identified in ECCC-29 above, ECCC believes there is some uncertainty as to whether the proposed mitigation measures would address the residual effects on marine and migratory birds. In the absence of systematic searches and documentation of stranded birds (live and dead), and a discussion of why certain mitigation measures were chosen over other options, the proponent cannot state with	

	certainty that the project's activities will not result in significant residual adverse effects or population-level effects. In order to verify the effectiveness of mitigation measures and to address any uncertainty in the prediction of residual adverse effects on marine and migratory birds, the proponent should implement a systematic monitoring program.
Request 15-Apr-19	A. Provide an analysis of feasible options to further mitigate adverse effects to marine and migratory birds with a rationale for the selection of the mitigation measures that will be implemented. B. Provide information on how the proponent intends to conduct follow-up to verify the effectiveness of mitigation measures and address uncertainty in the predictions.
Equinor Response 15-Nov-19	A. The feasibility of mitigation options to reduce adverse effects on marine are migratory birds are addressed in the EIS. Section 2.7.1.4 addresses the feasibility of flaring options, including no routine flaring, as an option for gas management which in turn reduces the potential effects of flaring on MMB. Section 2.7.1.7 discusses the feasibility of different lighting options for the FPSO, and as stated the feasibility of implementing some of these options are being investigated during detail design. Equinor Canada, as stated during the Regulatory Review workshop in May 2019 and as indicated in in response to IR-21/ECCC-8, committed to providing information to ECCC regarding lighting design, once lighting design options are available. Similarly, the mitigations, along with others are summarized and listed in Section 10.1.5.2 of the EIS. As indicated in response to IR-101/Conformity DFO-3 "the interaction tables for each VC chapter (Tables 9.6, 10.6, 11.6, 12.6, 13.6) will include a column identifying the mitigation measure that are applicable to each activity." Furthermore, as stated in the EIS (Section 10.1.5.2, Section 10.6, Table 18.2, Section 18.4.2) and as addressed in response to IR-177/ECCC-26, Equinor Canada is committed to developing, in consultation with ECCC-CWS, and implementing a stranded seabird search protocol and observation program suitable for the BdN Project. The development and implementation of such protocols for the search, recovery, documentation, and release of stranded birds will provide the necessary spatial and temporal coverage to mitigate strandings (Ronconi et al. 2015). To provide additional clarification in the EIS, the following edits will be made: Section 10.2.2.1: ***"Systematic search for and recovery of stranded, live birds on*** the FPSO, drilling installation and SBVs will be undertaken and birds found will be documented following protocols that will be developed in consultation with ECCC-CWS (see Section 10.6). ***The development and implementation of such protocols for the search, recovery, documentation, and release of stranded birds will provide the necessary spatial and temporal coverage to mitigate strandings (Ronconi et al. 2015)."*** Section 10.2.2.2: "As indicated above, routine flaring will not occur. Non-routine and/or safety flaring, when required, will be short in duration. ***The absence of routine flaring will mitigate the light emissions since the flare will be limited to a continuous pilot flare, and consequently will mitigate the distance at which the flare will attract nocturnally-active birds, and, in turn, the number of birds attracted. Equinor Canada is also investigating the use of a pilotless flare versus a continuous pilot flare. However, the assessment of the effects***

	of the flare in this EIS assumes a continuous pilot flare. Therefore, the effects assessment conclusion considers the worst-case scenario. During flaring events, bird attraction will likely be limited to within 16 km of the flare." <u>Section 10.6</u> "Routine searches for stranded seabirds will be conducted on the FPSO, drilling installation and SBVs. Equinor Canada will develop a protocol for ***systematic searches for, and documentation of*** stranded seabirds in consultation with ECCC-CWS applicable to the Project…If a SAR is found alive (stranded) or dead on the FPSO, drilling installation and/or SBVs, a report will be sent to ECCC-CWS for identification." B. See response to IR-146/Conformity ECCC-4 ECCC-25

IR-181 **ECCC-31**	**Guideline Ref:** Part 2, Section 9	**EIS Ref:** Section 10.6
Context/Rationale	In Section 10.6 of the EIS "In accordance with ECCC-CWS requirements, an annual report will be submitted to ECCC-CWS which summarizes stranded and/or seabird handling occurrences." In addition to the annual report that summarizes the stranding and/or handling information, the proponent should provide all of the data associated with these stranding and/or handling occurrences.	
Request **15-Apr-19**	Provide occurrence data during all phases of the project to ECCC in addition to the annual summary report.	
Equinor Response **2-May-19**	Equinor Canada provided the following response to this IR in May 2019. *It is not necessary to include this level of detail in the EIS. Reporting requirements are included in the permit issued by CWS. In addition, the seabird search/stranding protocol (see comment ECCC-27) will provide information on reporting of data.*	
ECCC Response **10-Jun-19**	ECCC accepts the proponent's decision to include this information in the seabird search and stranding protocols referenced in ECCC-27 rather than the EIS. However, ECCC suggests that the proponent adjust the quoted statement in the EIS to "In accordance with ECCC requirements, an annual report and all occurrence data will be submitted to ECCC which summarizes stranded and/or seabird handling occurrences" to resolve ECCC's concerns.	
Equinor Response **15-Nov-19**	Upon review of the statement in the EIS and in consideration of the response by ECCC, the mitigation listed in Section 10.1.5.2, Section 10.6, and Tables 10.5, 10.6, 18.2 and 18.6 will be revised to read as suggested by ECCC. "In accordance with ECCC requirements, an annual report ***and all occurrence data*** will be submitted to ECCC which summarizes stranded and/or seabird handling occurrences."	

IR-182 **ECCC-33**	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.3.2
Context/Rationale	In Section 15.3.2 of the EIS "Although Project-related components, activities, and discharges may result in some localized, long-term interactions with marine-associated	

	avifauna in parts of the LSA throughout the life of the Project, including bird attraction to offshore lighting and other components, the number of individuals that may be affected, and the temporary and reversible nature of these interactions, means that the Project will not have overall ecological or population-level effects, and particularly, will not result in a detectable decline in overall bird abundance or changes in the spatial and temporal distributions of bird populations within this area" Although the majority of stranded birds encountered on platforms and vessels are thought to be found alive and released successfully, without a systematic search methodology and documentation of search effort, it is difficult to quantify how many dead individuals may have been undetected during the searches. It should be acknowledged that the information that is currently available is likely an underrepresentation of the proportion of individuals entering into contact with the FPSO, given that dead birds may fall into the sea or fall victim to predation by scavengers before they are observed. Given the likely underrepresentation of the number of birds coming into contact with the FPSO, it is difficult to conclude with certainty that the Project will not result in a "detectable decline in overall bird abundance". ECCC is of the view that uncertainty remains and that the proponent should undertake a monitoring program that includes systematic surveys and documentation of search efforts during operation in order to support their conclusion.
Request 15-Apr-19	Discuss the uncertainty related to the limitations of existing data in the development of the EIS conclusion in Section 15.3.2 that "the Project will not have overall ecological or population-level effects and will not result in a detectable decline in overall bird abundance." Identify data and knowledge gaps. Provide information on how the proponent intends to conduct follow-up to verify the effectiveness of mitigation measures and address uncertainty in the predictions. Identify data and knowledge gaps.
Equinor Response 15-Nov-19	As indicated in the EIS and in response to IR-143/ECCC-24, there is a depth of information available for the NL offshore area as a result of several decades of ongoing EEM programs for development projects. Furthermore, the offshore oil and gas industry is a highly regulated and mature industry worldwide, which provides a high degree of certainty in respect of potential effects and effective mitigation strategies. However, Equinor Canada acknowledges that there is some uncertainty regarding the level of interaction of marine and migratory birds offshore due to the non-systematic protocols for searching for and documenting stranded birds. This uncertainty is reflected in the EIS predictions in Chapter 10. To support the amended text in Section 10.5.2 (see IR-179/CEAA-79), the following text will be added to the end of Section 10.2.2.1 – Lighting: ***"The natural variability in mortality and population size in marine birds in the Northwest Atlantic that are vulnerable to attraction to lighting/flaring (Leach's storm-petrel) is poorly understood (Wilhelm et al. 2019). Predation at nesting colonies is believed to be the major cause of mortality (Stenhouse and Montevecchi 1999; Bicknell et al. 2009; Pollet et al. 2019; Pollet and Shutler 2019). High levels of mercury born by these birds, and important shifts in demersal and pelagic food webs in the northwest Atlantic have also been identified as potentially important sources of mortality and potentially population decline (Bond and Diamond 2009; Head and Pepin 2010; Buren et al. 2014; Pollet et al. 2016; Burgess et al. 2016 in Pollet et al. 2019). Strandings on***

	offshore Newfoundland oil platforms due to light attraction are mitigated by search for, recovery, release of stranded birds. Of those birds found on offshore platforms a large proportion are found alive and those found dead appear to have died of hypothermia or dehydration. This fact, and the slow speed at which attracted birds approach platforms, suggests that few birds die in collisions and fall into the sea undetected. Based on the research cited above and on the mitigation of strandings by recovery and release, mortality due to the Project was judged to be low in magnitude compared to other sources of mortality. Confidence in this prediction is tempered by uncertainty about the proportion of the birds attracted to lighting/flaring that suffer mortality but are not found on platforms. Therefore, based on this uncertainty, these predictions are made with an overall moderate level of confidence." As stated in the EIS, Equinor Canada is committed to undertake a follow-up monitoring program and the monitoring program will be designed once Project design is complete. Further clarification regarding follow-up monitoring is provide in response to IR-146/Conformity ECCC-4 and ECCC-25. In addition, as stated in Section 10.6 of the EIS, Equinor Canada is committed to a seabird observation program, which may involve the use of technology. Similarly, until design is final, and in consideration of technological advancements, the stranded bird search protocol may also include technology. Clarification regarding survey protocols provided in IR-180/ECCC-30 states that "The development and implementation of such protocols for the search, recovery, documentation, and release of stranded birds will provide the necessary spatial and temporal coverage to mitigate strandings (Ronconi et al. 2015)." Stranding data and data from the seabird observation program will be used to verify the EIS predictions and overall provide more information regarding seabird interactions with offshore installation.

IR-183	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.1.2.3
ECCC-34		
Context/Rationale	In Section 16.1.2.3 of the EIS "There are two licensed bird handling and rehabilitation centres for treatment and rehabilitation in NL –Suncor Environment Centre (St. John's), and NL Environmental Association (Ship Cove). For the Suncor Environment Centre in St. John's, prior to commencing any offshore operations Equinor Canada partners with Suncor cooperate in maintaining the centre and sharing access to it. The Suncor Environment Centre would be primary destination for oiled or injured seabirds for veterinarian-controlled triage, stabilization, and treatment. In addition, during operations, Equinor Canada maintains an agreement with an on-call veterinarian for the bird handling centre." The facility mentioned in the above statement is only permitted to host up to 10 affected individuals at one time while a more severe oiling incident may result in far more birds being affected.	
Request 15-Apr-19	A. Clarify how a potential incident affecting more than 10 recoverable individuals would unfold, as the carrying capacity of the local rehabilitation facility can only accommodate 10 affected individuals at one time. B. Describe the expected success rate of bird rehabilitation to be an effective mitigation measure. C. Clarify if the expected success rate of rehabilitation is factored into the residual effects analysis.	

Equinor Response 15-Nov-19	A. In the event of an accidental event that causes the oiling of birds in excess of the capacity of Newfoundland licensed bird handling and rehabilitation centres, Equinor Canada will employ third-party bird handling facilities, such as Tri-state, to assist in oiled bird handling and rehabilitation. This information will be included in the Oil Spill Response Plan, which as indicated in Section 16.1.1 of the EIS will be submitted to the C-NLOPB in support of an operations authorization for the BdN Project. B/C. As indicated in Section 16.7.5.6, the success rate for bird rehabilitation has historically been low, but has improved over recent years (French-McCay 2009; Wolfaardt et al. 2009). The significance determination for Marine and Migratory Birds for accidental events, as stated in Section 16.7.5.8 of the EIS, states "a precautionary conclusion is drawn that residual environmental effects from an extremely low probability occurrence subsurface blowout on Marine and Migratory Birds are predicted to be significant depending on the specific occurrence, the nature and degree of the event, and the presence of certain species of birds, but extremely unlikely to occur. Infrequent batch spills and SBM releases are predicted to affect a smaller number of individuals and be reversible at the population level, therefore would not cause a detectible decline in overall abundance or change in distribution over more than one generation. Therefore, it is predicted that batch spills and accidental SBM releases associated with the Project will not result in significant residual adverse effects on Marine and Migratory Birds." Significance determinations are provided for residual effects (i.e., after the application of mitigation) and, therefore, by definition considers the effectiveness of applied mitigations. Updates to the EIS are not required.

IR-184 **ECCC-35**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.1.2.3
Context/Rationale	In Section 16.1.2.3 of the EIS "Primary response: surveillance to determine the location and extent of wildlife injuries and death; and deflecting oil away from areas of high sensitivity where practicable." In order to determine the best response (i.e. opportunities to deflect oil away from high sensitivity areas, it is important during the primary response stage to surveil and record the overall abundance and distribution of all seabirds at the spill site (whether live, injured or deceased).	
Request 15-Apr-19	Include surveillance and documentation of the overall abundance and distribution of all seabirds at the spill site, not only those that are injured or deceased.	
Equinor Response 2-May-19	Equinor Canada provided the following response to this IR in May 2019. *Wildlife surveillance methods will be provided in the OSRP, which is required to be submitted to the C-NLOPB in support of the OA application.*	
ECCC Response 10-Jun-19	ECCC agrees with this approach and expects this statement to be included in the EIS.	
Equinor Response 15-Nov-19	The statement in Section 16.1.2.3 under subsection "Oiled Wildlife Response" will be amended to read as: "Spill response and response to oiled wildlife, including ***wildlife surveillance and documentation methods***, will be described in the BdN Project OSRP."	

IR-185 **ECCC-36**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.1.2.3
Context/Rationale	In Section 16.1.2.3 of the EIS “Spill response and response to oiled wildlife, including seabirds, will be described in Equinor Canada’s Project OSRP” Creation of plans for oiled wildlife response, including marine and migratory birds, is an important inclusion in the Oil Spill Response Plan (OSRP). ECCC should be consulted on the development and implementation of a Wildlife Emergency Response Plans (WERPs), and is available to review these plans, if necessary.	
Request **15-Apr-19**	Include oiled wildlife response, including marine and migratory birds, as part of the overall Oil Spill Response Plan through the development of a Wildlife Emergency Response Plan (WERP).	
Equinor Response **2-May-19**	Equinor Canada provided the following response to this IR in May 2019. *This information will be provided in the OSRP, which is required to be submitted to the C-NLOPB in support of the OA application.*	
ECCC Response **10-Jun-19**	ECCC agrees with this approach and expects this statement to be included in the EIS.	
Equinor Response **15-Nov-19**	Section 16.1.2.3 of the EIS states “Spill response and response to oiled wildlife…will be described in Equinor Canada’s Project OSRP.” As stated in our 2-May-19 response, the OSRP will include details regarding oiled wildlife response measures. Updates to the EIS are not required.	

IR-186 **Conformity ECCC-3**	**Guideline Ref:** 7.6.1	**EIS Ref:** 16.7.5.6
Context/Rationale	Non-conformity with EIS Guidelines. The impacts of sheening on migratory birds are referenced in Section 16.7.5.6 – Residual Environmental Effects Assessment and Evaluation (on page 16-156), but is not included as a “potential effect” in Table 16.38 – Summary of Residual Accidental Event-Related Environmental Effects on Marine and Migratory Birds (pg. 16-157)	
Request **15-Apr-19**	Explain the exclusion of potential effects of sheening on migratory birds from Table 16.38 of the EIS.	
Equinor Response **15-Nov-19**	It is the opinion of Equinor Canada that the EIS is conformant with Section 7.6.1 of the EIS Guidelines. The effect of sheening on Marine and Migratory Birds is provided in detail in Section 10.2.2.2 of the EIS. Section 16.7.5.6 provides a summary of the information presented in Chapter 10. Sheening is discussed in Section 16.7.5.6 as a potential effect resulting from Batch Spills. The effects assessment tables for accidental events is based on ‘worst-case’ effects, as per the EIS Guidelines. Table 16.38 provides a summary of all potential residual accidental event-related effects, under broad categories, with effects assessment determinations capturing the 'worst-case' from all the potential effects. Resulting effects, such as sheening, are considered in the overall effects assessment rating, where the effect is considered worst-case. Updates to the EIS are not required.	

IR-187 / **ECCC-39**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref: 16.7.5.6:** Section 16.7.5.4
Context/Rationale	In Section 16.1.2.3 of the EIS "The measured toxicity of dispersants themselves to birds varies among studies. Prince (2015) found very low toxicity. Fiorello et al. (2016) found that common murre, a species that forages underwater, exposed to Corexit EC9500a, crude oil, develops conjunctivitis and is at higher risk of corneal ulcers. Preliminary studies of dispersant use during the Deepwater Horizon blowout show that dispersants enhance oil's toxicity to early life stages of coastal waterbirds (Beyer et al. 2016). The dispersed oil has similar effects to that oil, as presented earlier, but the size of the slick and exposure concentrations would be lower than untreated oil. Hence, dispersant mitigates the potential adverse effects of oil on birds compared to untreated oil." ECCC offers an additional reference (Whitmer et al. (2018)) that should be included in the EIS, which describes the possible negative impacts of dispersants on birds. Whitmer, E.R., Elias, B.A., Harvey, D.J., and Ziccardi, M.H. (2018). An experimental study of the effects of chemically dispersed oil on feather structure and waterproofing in Common Murres (Uria aalge). Journal of Wildlife Diseases. 54(2): 315-328.	
Request 10-Jun-19	Include a consideration of Whitmer et al. 2018 conclusions and update the effects assessment as necessary taking into account possible negative impacts of dispersants on migratory birds not considered in the range of potential effects.	
Equinor Response 15-Nov-19	In consideration of Whitmer et al (2018), Section 16.7.5.4 of EIS will be updated to include the following text: "The dispersed oil has similar effects to that of oil, as presented earlier, but the size of the slick and exposure concentrations would be lower than untreated oil. Hence, dispersant mitigates the potential adverse effects of oil on birds compared to untreated oil. ***A study of the effect of dispersant use on feather structure, waterproofing, and buoyancy of common murres showed no significant difference between the effects of oil alone and the effects of a mixture of dispersant and oil (Whitmer et al. 2018). In both cases the effect was dose-dependent and resolved over two days. A high concentration of dispersant alone caused an immediate, life-threatening loss of waterproofing and buoyancy, which resolved within two days***." The addition of this information does not alter the conclusions of the EIS. The EIS conclusions remain valid. References: Whitmer, E.R., B.A. Elias, D.J. Harvey, and M.H. Ziccardi. 2018. An experimental study of the effects of chemically dispersed oil on feather structure and waterproofing in Common Murres (*Uria aalge*). Journal of Wildlife Diseases, 54(2): 315-328.	

IR-188 / **ECCC-42**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.7.5.6
Context/Rationale	In Section 16.7.5.6 of the EIS "For the crude batch spills, both surface and at seafloor, surface oiling (thicker dark brown sheens (0.01 to 0.1 mm) were predicted to extend approximately 375 km from the release site during the worst-case environmental conditions for surface oiling (i.e. calmest wind-speed period during the summer/ice-free conditions, which would result in the largest amount of oil on the water surface…For the larger surface batch spills, the model predictions suggest that both the potential for	

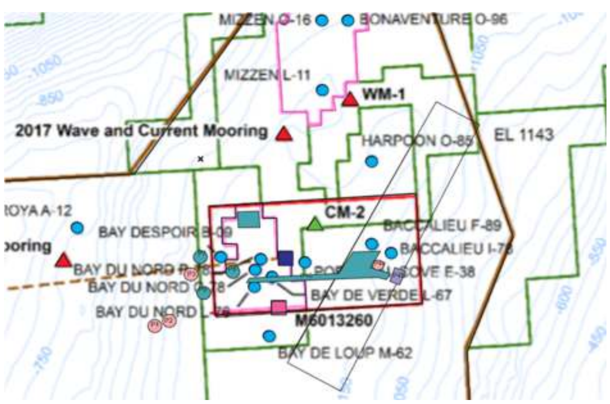
	exposure and the likelihood of adverse effects on marine and migratory birds would be low in magnitude. Although birds within 250 km of the release may be exposed, the change in habitat availability and quality as well as effects on health will be low in magnitude, based on dissipation rates." The proponent states that the larger spills were predicted to dissipate over large areas (375 km from release site), which in the offshore during certain seasons (summer and fall) could impact a large number of birds that are sensitive to oiling, such as murres, dovekies, kittiwakes, etc. It is not clear what information or evidence was used to support this conclusion.
Request 15-Apr-19	In Section 16.7.5.6 of the EIS provide additional information to support Equinor's conclusion that the adverse effects on marine and migratory birds would be low in magnitude.
Equinor Response 2-May-19	Equinor Canada reviewed the effects assessment analysis for batch spills in consideration of the comments offered by the reviewer. As stated in Table 4.5 of the EIS, low magnitude is a detectable change that is within the range of natural variability, with no associated adverse effect on the viability of the affected population; medium magnitude is a detectable change that is beyond the range of natural variability, but with no associated adverse effect on the viability of the affected population; high magnitude is a detectable change that is beyond the range of natural variability, with an adverse effect on the viability of the affected population. Based on the area predicted to be oiled from a large batch spill and the maximum density of a species most at risk from oiling (i.e., murres (96.5 birds/km² in April-July), it is predicted that while individual species may be affected, there will not be an adverse effect on the viability of the population. The effects rating in Section 16.7.5.6 of the EIS will be amended to read as: "For the crude batch spills, both surface and at seafloor, surface oiling ***by*** thicker dark brown sheens (0.01 to 0.1 mm) …For the larger surface batch spills, the model predictions suggest that both the potential for exposure and the likelihood of adverse effects on mortality/injury and health ***of individual*** marine and migratory birds would be ***low to medium*** in magnitude. Underwater habitat within 250 km of the release may be exposed to in-water concentrations exceeding the 1ug/L threshold, therefore a change in habitat availability and quality will be of ***low to medium magnitude."***

IR-189 **DFO-9**	**Guideline Ref:** Part 2, Section 7.1.5	**EIS Ref:** Section 6
Context/Rationale	Critical habitat for Northern and Spotted Wolffish is currently proposed. This should be consistently noted throughout the EIS.	
Request 15-Apr-19	Describe critical habitat for Northern and Spotted Wolffish as proposed throughout the EIS.	
Equinor Response 2-May-19	Equinor Canada responded to this IR in May 2019. The following information was provided: *Critical habitat for northern and spotted wolfish is described in Section 6.1.9, illustrated on Figure 6-35; referenced in Table 9-14; referenced in Section 9.4.1; and illustrated in Fig. 9-6 and 9-7.*	
DFO Response 10-Jun-19	The issue is that critical habitat is not consistently noted as "proposed" throughout the EIS. Critical habitat and proposed critical habitat differ in that critical habitat has legal protection under the Species at Risk Act, while proposed critical habitat does not.	

Equinor Response 15-Nov-19	Critical habitat for northern and spotted wolffish will be described as "proposed" throughout the EIS. The following edits will be made to the EIS: Section 6.1.9: "Although species-specific areas of relatively high aggregation have been identified in the Northwest Atlantic, ***proposed*** critical habitats have only been ***delineated*** for spotted and northern wolffish in the RSA. However, no ***proposed*** critical habitats overlap with the Project Area." "***Proposed*** critical habitat has been ***delineated*** for spotted and northern wolffish, primarily along the northeast shelf and slopes of the Grand Banks… (Figure 6-35, Figure 6-36, Figure 6-37, DFO 2018b). The ***proposed*** critical habitat extent was based on preferred sea bottom temperatures and depth for these species…." Section 15.2.2 "Of SAR that have been assessed, ***proposed*** critical habitat has only been ***delineated*** for northern and spotted wolffish and is located on the edge of the Grand Banks and Labrador Shelf that is northeast of the Project Area (DFO 2018a)."

<table>
<tr><td>IR-190
DFO-77</td><td>Guideline Ref: Part 2, Section 7.1.9.1; Section 7.3.8.3</td><td>EIS Ref: Section 6.4</td></tr>
<tr><td>Context/Rationale</td><td colspan="2">Throughout Section 6.4 of the EIS, mapped information showing overlap of activities has not been presented, which is important to understand zones of influence by the proposed Project and by past drilling activities given the current coral closures.

Refer to the figure below for an example of an overview map which details current and future activities, as well as NAFO Closure #10.

Overview Map of the Project in relation to NAFO #10 VME Closure, existing well sites (light blue) and planned well sites for the Bay du Nord Project

</td></tr>
<tr><td>Request
15-Apr-19</td><td colspan="2">Include an overview map In Section 6.4 of the EIS.</td></tr>
<tr><td>Equinor Response
15-Nov-19</td><td colspan="2">See response to IR-72/DFO-59.</td></tr>
</table>

IR-191 **DFO-54**	**Guideline Ref:** Part 2, Section 7.1.3; Section 7.1.9.1	**EIS Ref:** Section 6.1.7.6; Section 6.4
Context/Rationale	Section 6.1.7.6 of the EIS does not adequately describe the relationship between corals and sponges, Ecologically and Biologically Significant Areas (EBSAs), Significant Benthic Areas (SBAs), and Vulnerable Marine Ecosystems (VMEs). The concept of SBA and EBSA are not clearly differentiated (e.g., SBAs are expected to be EBSAs, but not all EBSAs would be SBAs), nor are area-based management measures intended to protect some of their features (e.g., DFO's Marine Refuges, and NAFO's fisheries closures). SBAs identified by DFO (DFO 2017a) are not included or considered in the EIS. Current VME delineation by NAFO (NAFO 2016) does not appear in the EIS. VMEs represented in maps (Figures 6-67 to 6-75) were from 2008 – NAFO's first attempt to delineate VMEs (not current), while NAFO Closure #10 was created several years later, affecting accuracy of maps. In the Project Area, SBA and VME are the terms used to describe biogenic habitats defined by structure-forming taxa like corals and sponges by DFO and NAFO respectively (DFO 2017a, NAFO 2014, 2016). Both DFO and NAFO have delineated areas/ polygons that provide the current best operational boundaries for these habitats. Both organizations have performed evaluations of the potential impacts of fishing on these areas (e.g. DFO 2017b, and NAFO 2016), and many considerations can also be used to inform the potential impacts of oil and gas development (including spills and blow-outs). A map of the SBAs and their intersection with the LSA and Core BdN Development Area with these areas have not been included in the EIS. Given that Equinor's Survey results have not been analyzed in the context of the identified coral and sponge habitats, characterizing the risks is not possible.	
Request **15-Apr-19**	A. Describe the relationship between corals and sponges, EBSAs, SBAs and VMEs and area-based management measures. B. Incorporate current VMEs in the EIS. C. Incorporate SBAs in the EIS. D. Consider further analyses and evaluation of the DFO and NAFO delineated areas / polygons and perturbations and impacts (such as fishing) which have already been assessed in these areas. E. Provide a map of SBAs and discuss their overlap with the Project. F. Describe survey results in the context of identified coral and sponge habitat. G. Update effects assessment, as necessary.	
Equinor Response **15-Nov-19**	A. Marine Refuges, NAFO Fisheries Closures, EBSAs (identified by DFO and the Convention on Biological Diversity), and VMEs have been described in Section 6.4 of the EIS. Current information from publicly available sources on SBAs and VMEs will be added to the EIS (see part B and C below). Further, coral and sponge habitats and potential effects associated with Project activities have been described in Section 9.2 and summarized in Section 12.2. Special Areas identified for the presence of benthic habitats are described in Section 6.4. Benthic habitats (including corals and sponges) within the RSA are described in Section 6.1 of the EIS. The text in Section 6.4.2.3 of the EIS will be amended to read as: "In December 2017, DFO designated seven Marine Refuges off the coast of Nunavut and NL to protect portions of sensitive and productive marine habitat. ***As of April 2019, there are 14 Marine refuges designated by DFO in NL waters,***	

	11 of which are in the NL Shelves Bioregion (Figure 6 69). The Northeast ***Newfoundland*** Slope Closure intersects with the LSA ~~around the Project Area~~ (Table 6.58). Hawke Channel Closure is located off the coast of Labrador and is outside the RSA. ***Canada has committed to protecting 10% of marine and coastal areas by 2020. Marine refuges are a key component of conservation measures to meet this target. These marine refuges, which are established through licence conditions or variation orders under the Fisheries Act, are not specifically designed to address long-term biodiversity objectives, and are subject to potential amendments. Currently, any areas within a marine refuge, or other effective area-based conservation measure, where oil and gas extraction occurs, will not be included in Canada's marine conservation targets (DFO 2019; Cision 2019). The BdN Project Area does not intersect with any established marine refuges."*** B. Detailed descriptions of VMEs were requested from DFO in May 2019 and from NAFO in July 2019. As of September 12, 2019, this information has not been received. For clarity, the text in Section 6.4.4.2 will be amended to read: "In addition, coral, sponge and sea pen communities can act as nurseries, refuges and as spawning and breeding grounds for many species (WG-EAFM 2008; FAO 2016). ~~VMEs are illustrated in Figure 6 75. DFO refers to these VMEs areas as Significant Benthic Areas, (DFO 2017k).~~ ***Vulnerable Marine Ecosystems (VMEs) have been identified in the NAFO regulatory area (Figure 6-75). Portions of VMEs may be closed to bottom fishing activities (Section 6.4.4.3). VME areas in the Newfoundland offshore, which have been identified for sponges, sea pens and large gorgonian corals, were updated in 2016 (NAFO 2016a). Descriptions of these VMEs are not publicly available.***" ~~NAFO has also identified seamounts and knolls (including the Orphan Knoll, NL Seamounts and Fogo Seamounts) (see Figure 6 75) as likely to host VME habitats, which include corals, sponges and a range of vulnerable fish species (e.g., alfonsino, orange roughy, silver roughy, wreckfish and cardinal fish) considered to be endemic to the area (WG-EAFM 2008).~~ ~~The NAFO Joint Fisheries Commission-Scientific Council Working Group on Ecosystem Approach Framework to Fisheries Management (WG-EAFM) has identified VME candidate areas for corals, sponges and seamounts in NAFO Divisions 3LMNO (WWF 2012; FAO 2016). Nine areas identified as containing VMEs are off eastern NL within and beyond Canada's EEZ. These VMEs, which are general areas of known ecosystems, are not protected, although portions of them may eventually receive protection through NAFO processes (WG-EAFM 2008). Table 6.68 describes VMEs located within the RSA. As illustrated in Figure 6 75, the Sackville Spur VME intersects with the northern tip of the Project Area and LSA. The LSA around the TR intersect with the Northeast Shelf and Slope (within the Canadian EEZ) and Northern Flemish Cap VMEs."~~ Table 6.68 will be deleted from the Chapter.

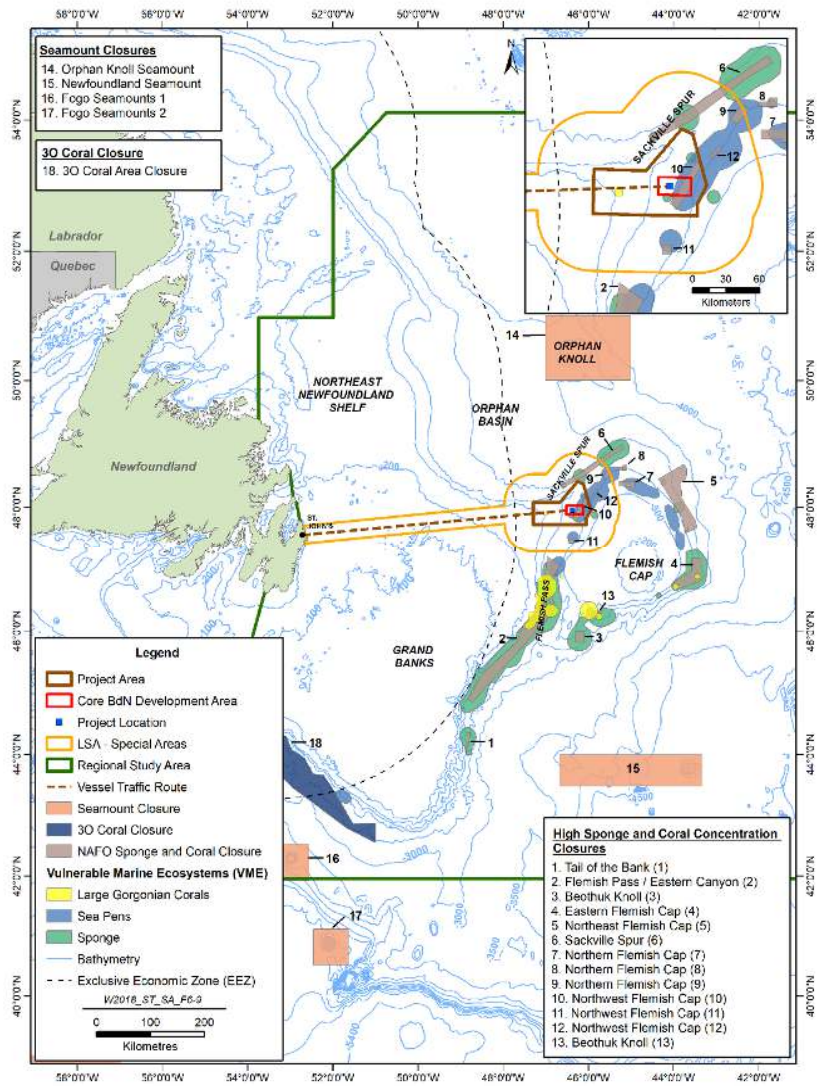


Figure 6-75 VMEs and NAFO Fisheries Closures

C. SBA shape files have been obtained from DFO. Various reports on SBA modelling have been received but the descriptive information is limited. Descriptions of SBAs were requested from DFO in June 2019. As of September 12, 2019, no additional information has been received.

For clarity, a new subsection will be added to Section 6.4.2 of the EIS and will read as:

Section 6.4.# Significant Benthic Areas

"Within the NL Shelves Bioregion, DFO has defined four types of SBAs, which are aggregations of sea pens, sponges, small gorgonian corals and large gorgonian corals, that form habitat for other species. In recent DFO modelling exercises, most of the shelf and slopes off Labrador were classified as likely to have sponge presence with the highest predicted sponge presence probabilities along the Labrador Slope and Saglek Bank. Based on the results of modelling, the highest predicted presence probabilities for sea pens were identified in the Laurentian Channel and on

the slope of the Northeast Newfoundland Shelf. The highest predicted presence probabilities of large gorgonian corals were identified off the edge of Saglek Bank and Slope in Northern Labrador. The highest predicted small gorgonian presence probabilities were identified along the southwest slope of the Grand Banks (Kenchington et al 2014).

Each of the four types of SBAs identified through modelling, occur in the RSA (Figure 6-#). None intersect with the CBDN or the Project Area. One SBA identified for Sea Pens intersects with the LSA for the PA and traffic route and one identified for Large Gorgonian Corals intersects with the traffic route (Table 6-#).”

Table 6.# Significant Benthic Areas in the RSA

Rationale for Identification / Designation	***Distance to Special Area (km)***		
	CBDN	***PA***	***LSA***
Sea Pens	***90***	***32***	***Intersect***
Sponges	***309***	***267***	***189***
Large Gorgonian Corals	***116***	***58***	***Intersect (TR)***
Small Gorgonian Corals	***272***	***215***	***141***

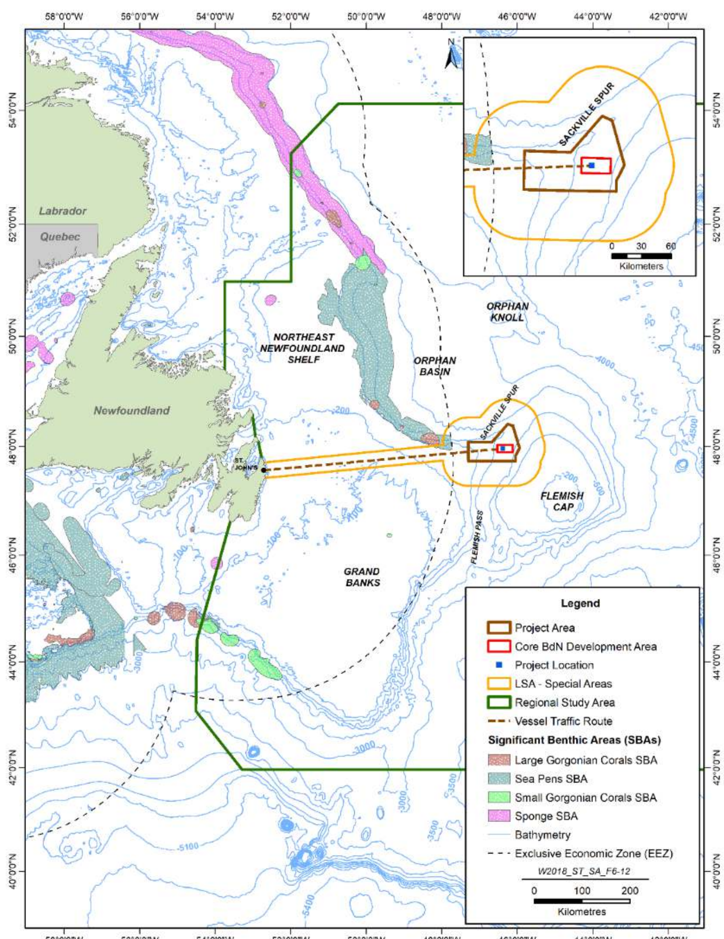


Figure 6-# Significant Benthic Areas

	D. The text in EIS Section 6.4.1 will be amended to read as: "Relevant data and information were obtained from federal and provincial regulatory bodies and other organizations that identify and/or administer such special areas in coastal and marine environments. ***The current condition of coastal and offshore special areas including NAFO delineated areas has been considered as the baseline. The existing environment therefore includes the continuing effects of past activities such as fishing and exploration drilling. Further, no information is available to characterize the environment of these areas prior to disturbance.***" The addition of this information does not alter the conclusions of the effects assessment. E. See response to Part C. F. Benthic invertebrates, including corals and sponges, are described in Section 6.1.7 of the EIS. Results from the 2018 Seabed Survey are summarized in Section 6.1.7.5 of the EIS. Response to IR-126/CEAA-59 provides information on amending the EIS to include additional data the 2018 Seabed survey. G. The addition of this information does not alter the conclusions of the EIS. The EIS conclusions remain valid. References: ***Kenchington, E., L. Beazley, C. Lirette, F.J. Murillo, J. Guijarro, V. Wareham, K. Gilkinson, M. Koen-Alonso, H. Benoît, H. Bourdages, B. Sainte-Marie, M. Treble and T. Siferd. 2014. Kernel density surface modelling as a means to identify significant concentrations of vulnerable marine ecosystem indicators. PLoS One, 9(10), e109365. Available at: https://waves-vagues.dfo-mpo.gc.ca/Library/40577806.pdf.*** NAFO. 2016a. Report of the Scientific Council Meeting 03-16 June 2016. NAFO SCS Doc. 16-14 Rev., Serial No. N6587

IR-192 **DFO-14**	**Guideline Ref:** Part 2, Section 7.1.9.1	**EIS Ref:** Section 6.4.2.3
Context/Rationale	In Section 6.4.2.3 of the EIS, the discussion of Marine Refuges is not inclusive. There are 14 Marine Refuges designated in NL waters with 11 located in the NL Shelves. While some of these were newly established, as in the seven referenced, other existing fisheries area closures met the criteria to be designated Marine Refuges and contribute to Canada's Marine Conservation Targets. The Division 3O Coral Closure Marine Refuge covers the 10,422 km2 portion of the NAFO 3O Coral Closure within Canada's inside EEZ. It prohibits all bottom fishing activities and includes areas of sea pens and large and small gorgonian corals. High concentrations of these structure-forming species provides habitat for many other species. The Division 3O Coral Closure should be included wherever Marine Refuges are described as located in the RSA. For a full list of Marine Refuges see http://www.dfompo.gc.ca/oceans/oeabcm-amcepz/refuges/index-eng.html	
Request **15-Apr-19**	A. Update text to include accurate existing information on the Marine Refuges located in the NL Shelves, as required in the Guidelines.	

	B. Table 6.58 in the EIS should include all of the Marine Refuges located in the RSA. C. Figure 6-69 in the EIS should display all of the marine refuges located within the geographic scope of the map. D. Include the Division 3O Coral Closure wherever Marine Refuges are described as located in the RSA throughout this EIS, including figures and tables. E. Update the effects analysis, as appropriate
Equinor Response 15-Nov-19	A. See response to IR-191/DFO-54 Part A. B. Table 6-58 will be amended to include the 3O Coral Closure area and the Lobster Area Closure: Gooseberry Island.

Table 6.58 Marine Refuges in the RSA

Marine Refuge	Rationale for Identification / Designation	Distance to Special Area (km)		
		CBDN	PA	LSA
Northeast Newfoundland Slope Closure (formerly known as Tobin's Point)	Dense aggregations of large, structure-forming cold-water corals provide niche space for other organisms. Prohibitions for bottom contact fishing activities. Area: 46,833 km²	92	34	Intersect
Funk Island Deep Closure	Conserves seafloor habitat important to Atlantic cod. Bottom trawl, gillnet and longline fishing activities are prohibited. Area: 7,274 km²	475	420	214
3O Coral Closure	***All bottom fishing activities are prohibited to protect concentrations of corals and sponges: fragile slow-recovering species that form habitat structure for other species. Area: 10,422 km²***	***646***	***588***	***321***
Lobster Area Closure: Gooseberry Island	***Lobster fishing is prohibited to protect lobster spawning habitat and increase egg production for this commercially important species.***	***538***	***480***	***89***

Source: DFO (2019).

A. Figure 6-69 will be amended as follows:

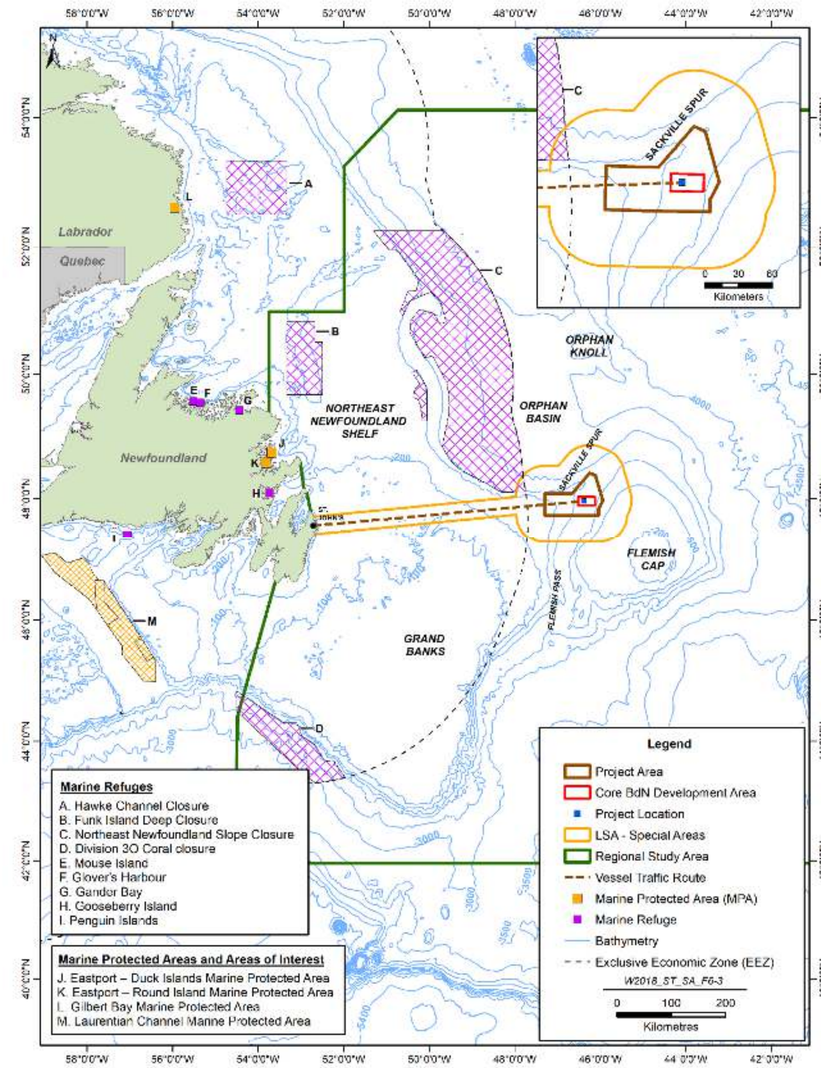


Figure 6-69 Canadian Marine Protected Areas and Marine Refuges in the RSA

B. Division 3O Coral Closure Marine Refuge will be included in Figure 6-69. Refer to Part C above

C. Distances and intersections have been calculated for the updated Marine Refuges in the RSA. No Marine Refuges intersect the Core Bay du Nord Development Area or the Project Area. The addition of this information will not result in changes to the conclusions of the EIS.

References:

DFO (Fisheries and Oceans Canada). 2019. List of Marine Refuges. Available at: https://www.dfo-mpo.gc.ca/oceans/oeabcm-amcepz/refuges/index-eng.html.

IR-193 **DFO-157**	**Guideline Ref:** Part 2, Section 7.1.9.1	**EIS Ref:** Section 6.4.2.3
Context/Rationale	In Section 6.4.2.3 of the EIS, different names are provided for the same closure: "Northeast Shelf and Slope Closure" in text, "Northeast NL Slope Closure" in Table 6.58.	
Request **15-Apr-19**	Update the text for consistent naming of refuges in Section 6.4.2.3 of the EIS.	
Equinor Response **15-Nov-19**	See response to IR-192/DFO-14	

IR-194 **DFO-15**	**Guideline Ref:** Part 2, Section 7.1.9.1; Section 7.3.8.3	**EIS Ref:** Section 6.4.2.5
Context/Rationale	In Section 6.4.2.5 of the EIS, in 2016-2017 DFO revaluated the PBGB-LOMA Ecologically Biologically Significant Areas (EBSAs) to align with the process that was used to delineate the remainder of the NL Shelves Bioregion EBSAs. Although the amended EBSAs are described here, elsewhere in the document (e.g. Table 6.53 p 6-239), the former EBSA delineation is described.	
Request **15-Apr-19**	Ensure consistent description of Ecologically Biologically Significant Areas throughout the EIS. For special areas that have not been included in the EIS or have been revised, provide a description and update effects assessment, as necessary.	
Equinor Response **15-Nov-19**	See response to IR-191/DFO-54. Descriptive information on EBSAs identified or revised by DFO in 2018 was not available at the time of EIS preparation (November 2018). Table 6-60 will be updated based in the information received as of September 15, 2019. The amended table can be found in Appendix E of this response document. The changes to special areas have also been incorporated into Section 12.2 and Section 16.7.7 (See response to IR-203/DFO-25). The addition of this information will not result in changes to the conclusions of the EIS. Reference for Table 6.60: ***DFO. 2019. Unpublished information on EBSAs.***	

IR-195 **DFO-16**	**Guideline Ref:** Part 2, Section 7.1.9.1	**EIS Ref:** Section 6.4.2.5; Figure 6-71
Context/Rationale	In Section 6.4.2.5 and Figure 6-71 of the EIS, this map only shows the NL Shelves Ecologically Biologically Significant Areas (EBSAs). There are two additional EBSAs in NL waters off the west coast.	
Request **15-Apr-19**	In Section 6.4.2.5 show all the Ecologically Biologically Significant Areas (EBSAs) in the geographic scope of the map or change the title from Canadian EBSAs to NL Shelves Bioregion EBSAs.	
Equinor Response **15-Nov-19**	The title of Figure 6.71 will be amended to read as: "Figure 6 71 Canadian Ecologically and Biologically Significant Areas ***in the RSA"***	

IR-196 DFO-23	**Guideline Ref:** Part 1, Section 3.2.3	**EIS Ref:** Section 12.1.1
Context/Rationale	In Section 12.1.1 of the EIS it is unclear how the boundaries of the RSA are supported by the description. Why the RSA contains Bonavista Bay, but not Trinity Bay or Conception Bay is confusing given that Section 16.7.7.2 of the EIS states that "modelling predicted the Northwestern Conception Bay PRMA, which is identified as a capelin spawning area, could potentially be affected by shoreline contact above ecological threshold". Also, the sharp angle cutting across the western portion of 2J/3K requires rationale.	
Request **15-Apr-19**	Provide a rationale for RSA boundary delineation for Special Areas.	
Equinor Response **2-May-19**	Equinor Canada provided the following response to this IR in May 2019. *The RSA is clearly described in EIS Section 4.3.1.1, and EIS Section 9.1.1* *Updates to the EIS are not required.*	
DFO Response **10-Jun-19**	Response is adequate	

IR-197 Conformity DFO-2	**Guideline Ref:** Part 2, Section 7.4	**EIS Ref:** Section 12.1.5.2
Context/Rationale	Mitigation measures were summarized within Section 12.1.5.2 of the EIS; however, they only encompassed standard industry guidelines with respect to ballast water, offshore waste treatment, chemical usage, sewage and food waste, geophysical surveys, and decommissioning. While industry standards may be met, this project is planned in identified vulnerable marine ecosystems that already merit special protection; industry standard mitigation measures were not designed with these habitat types in mind. The Proponent should provide additional justification regarding the efficacy of mitigation measures for vulnerable marine ecosystems.	
Request **15-Apr-19**	Provide the rationale for applying standard industry mitigation measures in vulnerable marine ecosystems and their efficacy to ensure protection.	
Equinor Response **15-Nov-19**	Equinor Canada does not agree that the EIS is in non-conformance with the EIS Guidelines as suggested by this Information Request. Mitigation measures provided in the EIS are derived from regulations, regulatory guidelines and industry best practices, and in particular instances, developed specifically for the BdN Development. Mitigations are designed to protect marine ecosystems, including vulnerable marine ecosystems. These mitigation measures have been implemented offshore Newfoundland, including deep waters such as the Orphan Basin, in previous exploration drilling programs and ongoing development projects. Industry standards are constantly evolving and improving as part of the adaptive management approach to environmental protection that is practiced in the offshore. Thus "industry standard" encompasses not only regulatory requirements but also best practices based on current operations. While standard industry mitigations are provided for in the EIS, and will be implemented throughout the project, Equinor Canada Ltd. has also committed to measures which are not industry standard offshore NL. For instance, the use of cuttings transfer system to relocate water-based cuttings discharges, as listed in Section 9.1.5.2. This mitigation is used offshore Norway in sensitive areas where coral reefs and colonies are present. Based on Equinor's global experience, it is used to reduce potential effects from drilling	

	discharges on sensitive coral colonies. Other mitigations and/or commitments listed in the EIS, which are not industry standard, include the following. Section 9.1.5.2 • Use of coral/sponge data to assist in subsea layout design (see additional information in IR-101/Conformity DFO-32) • The use of cuttings transfer system to relocate water-based cuttings discharges Section 10.1.5.2: • Use of lighting reduction strategies to the extent that worker safety and safe operations are not compromised • Routine and systematic searches for stranded seabirds • No routine flaring • Low pressure flare gas will be recovered Section 11.1.5.2 • Shut-down of air source arrays for all-beaked whales when detected within safety zone Section 12.1.5.2 • Use of coral/sponge data to assist in subsea layout design (see additional information in IR-101/Conformity DFO-32); • The use of cuttings transfer system to relocate water-based cuttings discharges Environmental effects monitoring (EEM) programs for existing production installations offshore NL have demonstrated that standard industry mitigations and regulatory guidance for discharges are effective in reducing the zone of influence to within 100s of meters to a few kilometers of the production installation. An EEM program will be implemented for the BdN Development Project. As described in the EIS, and further explained in response to IR-146/ConformityECCC-4; ECCC-25, the EEM program will be developed with a goal to verifying the impact predictions in the EIS and to monitor the efficacy of mitigation measures, as applicable.

IR-198 **DFO-144c**	**Guideline Ref:** Part 2, Section 7.3.1; Section 7.3.3; Section 7.3.4; Section 7.3.8.3	**EIS Ref:** Section 12.1.5.1; Table 12.3
Context/Rationale	It is not always obvious why potential environmental effects were not selected for certain project components/ activities in Section 12.0. Examples are below. In Table 12.3 in Section 12.1.5.1 of the EIS, potential environmental effects from presence, lighting and sound are noted for supply and servicing, but not for lighting and sound from presence of vessels for hook-up and commissioning. It also is not clear why the only discharge with potential effects is drill cuttings.	
Request **15-Apr-19**	Provide rationale why potential environmental effects were not selected consistently between Sections 9.1.5.1, 11.1.5.1 and 12.1.5.1 in the EIS.	
Equinor Response **15-Nov-19**	See responses to IR-98/DFO-144a, IR-149/DFO-144b and IR-151/DFO-91.	

<table>
<tr><td>IR-199
DFO-98</td><td>Guideline Ref: Part 2, Section 7.3.3, Section 7.3.8.3</td><td>EIS Ref: Section 12.1.5.1, Table 12.3; Section 12.2.2</td></tr>
<tr><td>Context/Rationale</td><td colspan="2">In Table 12.3 in Section 12.1.5.1 of the EIS There is potential for interactions between most of these project components/ activities and the VC, in terms of causing changes in environmental features. This applies mostly to Ecologically Biologically Significant Areas (EBSAs), as some of these areas were identified based on high densities of various taxonomic groups (i.e. corals, sponges, fish, marine birds, marine mammals, other invertebrates) occurring in the area.

Table 12.3 does not illustrate that many of the VCs that occur in these special areas were identified as important or significant for a variety of reasons. For example, EBSAs are identified based on uniqueness, fitness consequences, and/or aggregation. They are a tool for calling attention to an area that has particularly high Ecological or Biological Significance – to facilitate provision of greater-than-usual degree of risk aversion in management of activities in these areas (DFO 2004).

It is particularly important to draw attention to the EBSA criterion of fitness consequences, which applies to areas where the life history activities undertaken make a major contribution to the fitness of the population or species present. EBSAs where at-risk species occur are considered to have high fitness consequences if the area is perturbed because of the vulnerable nature of these populations. The Northeast Slope EBSA is an important area for 8 at-risk species: American Plaice, Atlantic Cod, Atlantic Wolffish, Northern Wolffish, Spotted Wolffish, Thorny Skate, Smooth Skate, and Roughhead Grenadier. In addition to important capelin spawning areas, the Eastern Avalon EBSA has significant colonies and foraging areas for several species of marine birds. Additionally, American Plaice and Killer Whale are at-risk species that are features of this EBSA.

None of the waste discharges have been identified as changing the environment for special areas in Table 9.3 and on page 12-19, the Proponent states that produced water and other waste discharges will not intersect the benthos and therefore will not have any effects on sensitive benthic areas or species. This characterization is incorrect, as it is well recognized that eutrophication and contamination of the pelagic environment directly affects the benthic environment through benthic-pelagic coupling. Not only will benthic pelagic coupling transfer enhanced primary production resulting from eutrophication to the benthos and flocculation processes transport contaminants to the bottom, but many sensitive benthic species have pelagic larvae that will be vulnerable to contaminants in produced water and other waste streams.</td></tr>
<tr><td>Request
15-Apr-19</td><td colspan="2">A. Update Table 12.3 in the EIS to include all potential interactions between project component/ activity and change in environmental features and/or processes. Potential effects of waste discharges should be represented in the Table.

B. Update effects assessment, as necessary (e.g., Section 12.2.2).</td></tr>
<tr><td>Equinor Response
15-Nov-19</td><td colspan="2">A. See responses to IR-144/DFO(21, 109, 145, 150, 153, 16), IR-149/DFO-144b and IR-203/DFO-25 Part B regarding updates to Chapter 12.

Waste discharges are included in Table 12.3 under the following bullets:

• Change in water quality that affect marine species endemic to special areas
• Disturbance, injury or mortality of benthic habitat and marine species, in special areas, resulting from sound, sedimentation, smothering, or direct contact.</td></tr>
</table>

	B. As indicated in response to IR-149/DFO-144b, Chapter 12 has been revised and can be found in Appendix G to this Response Document.

IR-200	**Guideline Ref:** Part 2, Section 7.3.8.3	**EIS Ref:** Section 12.2.1.1
DFO-148		
Context/Rationale	Information on the expected effects from the installation of subsea infrastructure is required to inform the effects assessment in Section 12 of the EIS (e.g., area affected, numbers impacted, time to recovery).	
Request **15-Apr-19**	Incorporate supplemental information on potential effects from installation of subsea infrastructure in Section 12 of the EIS.	
Equinor Response **15-Nov-19**	As stated in Section 12.2.2, "The following sections provide an assessment and evaluation of the potential residual effects of Core BdN Development activities upon defining features of Special Areas. The previously identified mitigation measures are considered integral within the environmental effects analysis, as relevant. More detail on potential Project effects on the marine environment can be found in Chapters 9, 10 and 11." The effects assessment for each project activity for each VC, as applicable to Special Areas, was not repeated in Chapter 12. Effects on fish and fish habitat from the installation of subsea infrastructures is addressed in Section 9.2.1.1. For clarity, the following text will be added to Section 12.2.1.1. ***"As discussed in Section 9.2.1.1,*** the offshore construction and installation phase of the Project will include localized physical interaction with the seabed and may result in direct disturbance to the seafloor and benthic habitats and fauna. In fine mud substrate habitat, such as that common in the Flemish Pass (Murillo et al. 2016), sampling, site preparation and installation activities will temporarily disturb the seabed environment, resuspending sediments and introducing sediments of different shapes and sizes ***(See Section 9.2.1.1)***."	

IR-201	**Guideline Ref:** Part 2, Section 7.3.8.3	**EIS Ref:** Section 12.1.2.1.2
DFO-99		
Context/Rationale	For Offshore Construction and Installation, Section 12.2.1.2 of the EIS states that the effect will be "short term in duration", but the last sentence of paragraph 4 says that coral and sponge biogenic habitats are fragile and recover slowly. This contradicts the assessment of duration.	
Request **15-Apr-19**	Update assessment of duration or justify determination of short term.	
Equinor Response **15-Nov-19**	As discussed in response to IR-107/CEAA-36, the duration of effects on fish and fish habitat was amended to medium-term from short term. Therefore, the duration of effect on sensitive benthic habitat, as addressed in Section 12.2.1.2 of the EIS will be amended to medium term. The text in Section 12.2.1.2 of the EIS will be amended to read as: "In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from offshore construction and installation are predicted to be adverse, low in magnitude, localized, ~~short~~ ***medium-term*** in duration, occurring	

	regularly when these activities are ongoing, and reversible. This prediction is made with a high level of confidence.

IR-202	**Guideline Ref:** Part 2, Section 7.1.9.1	**EIS Ref:** Section 12.2, Table 12.8, Table 12.9
DFO-24		
Context/Rationale	In Section 12.2 of the EIS, information regarding commercial fisheries in special areas is unclear. Table 12.9 of the EIS states that "special areas located in the general vicinity are valued for their biological and ecological characteristics and their importance for activities such as the fishing industry, but none are likely to have an active commercial fishery". Yet, Table 12.5 of the EIS states a defining feature of the UNCBD EBSA Slopes of the Flemish Cap and Grand Bank "includes a component of the Greenland halibut fishery grounds in international waters (i.e., Marine Fisheries)". Section 12.2 of the EIS states that the "Greenland halibut fishery is limited within the Project Area", but then goes on to state that "it is difficult to discern whether the fish species or fisheries are associated with the Project Area".	
Request **15-Apr-19**	A. Define "general vicinity" in Section 12.2 of the EIS. B. Confirm domestic and international fisheries occurring in the Special Areas and update the relevant sections of the EIS.	
Equinor Response **15-Nov-19**	A. The following amendments will be made to the EIS. Table 12.5: "• Special areas ~~located in the general vicinity~~ are valued for biological and ecological characteristics and/or their importance for **human** activities, such as fishing. ~~Industry, but none are likely to have an active commercial fishery~~" Table 12.6: "• Special areas ~~located in the general vicinity~~ are valued for biological and ecological characteristics and/or their importance for **human** activities, such as fishing." ~~Industry, but none are likely to have an active commercial fishery~~" B. Commercial fisheries, including communal commercial fisheries, in the LSA are described in Section 7.1 and assessed in Section 13.2. With the above amendments to the EIS, the effects assessment conclusions remain valid. Updates to the EIS are not required.	

IR-203	**Guideline Ref:** Part 2, Section 7.6.2	**EIS Ref:** Section 12.2, Section 16.7.7.2
DFO-25		
Context/Rationale	Potential effects of accidental events on the biological VCs are discussed in Sections 16.7.4 to 16.7.6 of the EIS and are not repeated In Special Areas Section 12.2. The assessment of effects on Special Areas is therefore focused on a change in habitat quality. This approach does not consider that marine fish and fish habitat, marine and migratory birds and marine mammals and sea turtles are the principle components that were used to identify these special areas. It is also inconsistent with the approach for the Special Areas effects assessment in Chapter 12 which looks at "change in environmental features and / or processes and change in human use and / or societal value".	

	The Ecologically Biologically Significant Areas (EBSAs) listed in Table 16.40 are from the 2016-2017 DFO re-evaluation, so it is not clear why some special areas have "description not available" listed for reason for designated.
Request 15-Apr-19	A. Justify focus on change in habitat quality for Special Areas, considering the VCs that contribute to Special Areas B. Provide the rationale for the effects assessment approach for Special Areas in Chapter 12 of the EIS. C. Update Table 16.40 and elsewhere in the EIS, as necessary.
Equinor Response 15-Nov-19	A. The text in EIS in Section 16.7.7.2 will be amended to read as: "The potential effects of accidental events on the biological VCs are discussed above in Sections 16.7.4 to 16.7.6 for marine fish and fish habitat, marine and migratory birds and marine mammals and sea turtles, respectively and are not repeated in this section. The assessment of effects on Special Areas is ~~therefore focussed~~ ***based on the effects assessment presented in Sections 16.7.4 to 16.7.6 and focusses on a change in environmental features and/or processes and change in human use of the Special Area and/or societal value of the Special Area***." B. As indicated in IR-149/DFO-144b, Chapter 12 will be amended to address the IRs associated with special areas rather than addressing individually in this response document. See Appendix G of this Response Document for the amended Chapter 12. C. Table 16.40 will be amended to include all special areas within the RSA. The revised table is appended to this response document in Appendix H. The text preceding Table 16.40 in Section 16.7.7.3 – Subsurface Blowout of the EIS will be amended to read as: ~~"It should be noted that the approach for identifying marine special areas that intersect with predicted oil exposure is conservative. Some of the special areas, which intersect based on surface oil and/or in-water hydrocarbon exposure, may be designated for their seabed features (i.e., corals and sponges) and will therefore not be directly affected by surface oiling or in-water TCH concentrations.~~ ***The modeling showed that surface oil above the ecological threshold could potentially reach various special areas identified for marine and migratory birds (i.e., Canadian EBSAs, NL seabird ecological reserves, UNCBD EBSAs and IBAs). In-water concentrations of THC above the ecological thresholds could potentially reach special areas identified for the presence of marine fish, shellfish, mammals and sea turtles (i.e., Canadian and UNCBD EBSAs). Oil concentrations in sediment and/or shoreline above the ecological threshold could potentially reach special areas identified for benthic habitat, spawning grounds, and coastal bird areas. Table 16.40 summarizes the predicted overlap of special areas in the RSA with the 95th percentile deterministic results for the ecological thresholds for hydrocarbon surface exposure, in-water concentration and shoreline or seafloor sediment exposure as applicable to the primary reason for designation of the special areas (e.g., benthic habitat features, presence of marine species, etc.)."***

IR-204 **CEAA-91**	**Guideline Ref:** Part 2, Section 7.1.9.1, Section 7.3.8.3	**EIS Ref:** Section 12.2
Context/Rationale	Section 12.1.4 states "This analysis has focused on identifying key potential Project-VC interactions and anticipated changes to the existing biophysical environment resulting from planned Project activities that may, through one or more associated pathways, lead either directly or indirectly to overall effects on the biological or sociocultural aspects of Special Areas." Section 12.2 of the EIS states that "sound, produced water and other waste discharges would not reach the depths of the Special Area and not likely affect benthic species and habitats". The sound modeling shows sound attenuating through the entire water column for considerable distances and impinging on the seafloor which contradicts the EIS statement in Section 12.2 which it does not in Special Areas. Section 7.3.8.3 of the EIS Guidelines requires an effects analysis from potential changes on special area environments and features. The Agency requires clear understanding of logical flow of methodology with the conduct of the effect analysis to substantiate the conclusions.	
Request **15-Apr-19**	In Section 12.2 of the EIS update the effects analysis on benthic interaction in Special Areas with the Project emissions and discharges through various pathways to ensure all potential effects are included in the effects analysis to support Equinor's conclusion.	
Equinor Response **15-Nov-19**	See response to IR-32/Con DFO-1, IR-149/DFO-144b, IR-199/DFO-98 and IR-203/CEAA-DFO-25 Part B. Amended Chapter 12 is appended to this response document, per response to IR-149/DFO-144b.	

IR-205 **CEAA-92**	**Guideline Ref:** Part 2, Section 3.1; Section 7.1.9.1, Section 7.3.8.3	**EIS Ref:** Section 12.2.3.1
Context/Rationale	In Section 12.2.1.1 of the EIS the zone of influence of WBM release at the seafloor and surface was not modeled, therefore an effects prediction is not estimated for the project drilling sites. The sensitivity and low resilience of the benthos and slow recovery has been documented in the literature cited, but effects to the ecological processes has not been addressed in the EIS. Section 3.1 of the EIS guidelines requires information on the fate of drill muds using dispersion modeling. This information is required to support Equinor's rationale in the conclusions and summary of effects.	
Request **15-Apr-19**	In Section 12.2.1.1 of the EIS provide substantiated effects analysis on water based mud released at the seafloor and surface, and subsequent areal extent of the loss of sensitive species and habitat in special areas and the direct and indirect effects on the marine ecosystem.	
Equinor Response **15-Nov-19**	Section 12.2.1.1 of the EIS discusses the effects of offshore construction and installation on Special Areas; effects of drilling activities on Special Areas are addressed in Section 12.2.3. As indicated in Section 12.2.3.1, the effects of drill cuttings discharges on fish and	

	fish habitat are discussed in detail in Section 9.2.3.2, including the results of drill cuttings modelling conducted in the Special Area – a fisheries closure area. See response to IR-208/DFO-102 regarding areas potentially affected by subsea infrastructure and cuttings discharges in the Core BdN Development Area. The EIS is complete. Updates are not required.

IR-206 **CEAA-94**	**Guideline Ref:** Part 2, Section 7.1.9.1, Section 7.3.8.3	**EIS Ref:** Section 12.2.4.1
Context/Rationale	In Section 12.2.4.1 of the EIS, the zone of various Project vessels underwater sound is not modeled to predict range of potential effects (masking, stress, avoidance, etc) on the transit routes through special areas. The zone of influence of sound emissions from support and service vessels were not provided in Appendix L; however, the possibility of effects were noted in this section. This information is needed to clearly understand the environmental effects of the Project.	
Request **15-Apr-19**	Provide rationale and supporting evidence for the determination of underwater sound effects from all project vessels without modeling the zone of influence of support and supply vessels as they transit through special areas.	
Equinor Response **15-Nov-19**	See responses to IR-11/CEAA-5 Part B and IR-119/CEAA-44. The effects of underwater sound from Project vessels and relevant modelling are addressed in Section 9.2.4.1 and Section 11.2.4.1. Chapter 12 provides a summary of the effects assessment on the various VCs as it relates to special areas. The EIS is complete. Updates to the EIS are not required.	

IR-207 **DFO-101**	**Guideline Ref:** Part 2, Section 7.6.2	**EIS Ref:** Section 12.2, Section 16.7.7.2
Context/Rationale	Section 12.2.6.1 of the EIS does not consider how the decommissioning process may affect corals and sponges. Decommissioning may result in further disturbance of already disturbed sensitive and vulnerable habitats.	
Request **15-Apr-19**	Describe potential effects of decommissioning on corals, sponges and seapens.	
Equinor Response **15-Nov-19**	Potential effects on corals, sponges and sea pens from decommissioning are addressed in Section 9.2.6 of the EIS. For clarification, the following text will be added to Section 12.2.6.1 of the EIS. "***The potential effects of decommissioning on corals and sponges are described in Section 9.2.6 and summarized here***. As the Core BdN Development will last 12 to 20 years, subsea infrastructure will likely be colonized by sessile invertebrates. Potential removal of subsea infrastructure would also remove the positive effects on fish habitat. Removal of the infrastructure will likely result in a localized decline in sessile or low-mobile invertebrates that were supported by the associated food and habitat subsidies, but mobile opportunistic species would be supported for a short time. Bomkamp et al. (2004) observed a difference in predatory gastropods and sea stars that were dependent on the bivalve food subsidies between present and former oil platform sites. Crab species were not different between the sites, indicating that mobile opportunistic species were not negatively affected (Bomkamp et al. 2004). Some small disturbances in deep-sea areas are also suggested to enhance diversity	

	in deep-sea environments (Grassle and Morse-Porteous 1987). There may also be short-term localized suspended particle and sedimentation disturbance effects to ***benthic species, such as corals, sponges and sea pens***,~~Marine Fish and Fish Habitat~~ similar to initial construction activities (see Section 12.2.1). ***If infrastructure remains in place, it would continue to provide support for benthic invertebrates. Where it is removed, r***ecovery and recolonization of the area ***may*** ~~would only~~ be enhanced if the infrastructure ***had*** supported connectivity to areas ~~that were~~ previously inaccessible by benthic invertebrates."

IR-208 **DFO-102**	**Guideline Ref:** Part 2, Section 7.3.8.3	**EIS Ref:** Section 12.3.3
Context/Rationale	Section 12.3.3 of the EIS comments that an individual well may have a zone of influence (ZOI) for drilling wastes of up to two kilometres with most effects above the predicted no effect threshold (PNET) of 1.5 mm within one kilometre in diameter (similar analysis is presented in the assessment of effects for fish and fish habitat on page 9-42). Beyond two kilometres, cuttings deposition will be patchy. DFO experts have provided the following advice "assuming that there will be a one kilometre ZOI with no overlap for each well, this would mean that for 40 wells proposed plus the eight exploration wells already drilled within the CBdN, the area affected would be 155 km², representing approximately 35% of the CBdN. Approximately 50% percent of the Northwest Flemish Cap VME (10) is within the CBdN. If effects are spread uniformly through the CBdN then the NWFC 10 could see almost 20% of its area impacted. The potential for further exploration and development would increase the area of the VME affected and could increase the level of harm per km² due to overlap in well ZOIs."	
Request **15-Apr-19**	Describe potential effects of drilling activities considering the information provided by DFO (e.g., portion of VME affected, drill cuttings overlap between sites).	
Equinor Response **15-Nov-19**	As presented in Section 9.2.3.2 and explained in response to IR-226/DFO-110, the drill cutting modelling results estimate that for the base case, with flocculation, the median deposition will be below the 1.5 mm and 6.5 mm predicted no effects thresholds (PNET) at less than 200 m from the modelled release site for up to 8 wells in the Core BdN Development Area. The base case, with flocculation is based on sediment characteristics sampled in the area and therefore, is likely reflective of the behaviour of drill cuttings discharge for the Bay du Nord Project. Equinor Canada disagrees with the reviewer's estimate that the zone of influence for drill cuttings would be 155 km², for the following reasons. 1. As described in Chapter 2, there are between 10-40 wells planned for the Core BdN Development. The majority of the wells will be drilled from templates - 4-slot, 6-slot or 8-slot templates - not at individual locations as assumed by the reviewer. Based on the preliminary subsea layout (see Figure 2-12), there are up to 5 template locations. Therefore, based on preliminary design it can be assumed that there will be 8 wells per template for a total of 40 wells. 2. As described in Section 2.5.3.2 an 8-slot template is approximately 21 m x 48 m (approximately 1,008 m²). 3. As indicated in response to IR-97/DFO-78 Part B, if a CTS were used, the maximum distance cuttings could be discharged from the template location is approximately 150 m.	

	4. Therefore, it can be estimated that the total footprint per template (cuttings plus template) would be approximately 400 m (based on 50 m (length of template) +150 m (maximum distance from template to CTS discharge location) +200 m (cuttings pile prediction from modelling)). 5. Conservatively, if a 400 m radius from the center of a template was assumed, the total zone of influence (template plus cuttings deposition area) per template would be approximately 0.5 km². Assuming five templates, the zone of influence associated with drilling in the Core BdN Area would be 2.5 km² (not 155 km² as suggested by the reviewer). 6. As stated in Section 2.4 of the EIS, based on preliminary design, the estimated total footprint of subsea infrastructure is approximately 7 km^2, which includes the five templates. To account for the potential zone of influence for cuttings dispersion (cuttings footprint plus CTS) the total area likely to be occupied by subsea infrastructure and cuttings zone of influence would be approximately 7.5 km^2. 7. The Core BdN Development Area is approximately 470 km² (see Section 2.4 of the EIS). Therefore, the potential zone of influence for drilling within the Core BdN Development Area would be approximately 0.5 percent of the Core BdN Development Area. Together with the entire subsea infrastructure footprint, the potential zone of influence of subsea infrastructure and cuttings zone of influence represents approximately 1.6 percent of the Core BdN Development Area. 8. For the Northwest Flemish Cap VME (10), which is 316 km², approximately 127 km² of this VME is within the Core BdN Development area. This represents approximately 40 percent of the VME, not 50 percent as suggested by the reviewer. Of this area, based on preliminary Project design, and as described in Chapter 2, up to two templates and a portion of a flowline corridor are planned within the FCA. In this portion of the FCA, the footprint of the templates plus cuttings would represent approximately 1 km². The flowline corridor (approximately 50 m wide) represents approximately 0.7 km². Therefore, total area that could potentially be affected by subsea infrastructure and drilling in this VME is approximately 1.7 km². This represents 1.3 percent of the VME within the Core BdN Development Area that could be affected by Project activities, or 0.5 percent of the total area of the VME, not 20 percent as suggested by the reviewer. The potential effects of drilling activities on benthic habitat, including those in the FCA are described in Section 9.2.3 of the EIS. If DFO determines that a *Fisheries Act* Authorization is required respecting the harmful alteration, disruption, or destruction (HADD) of fish habitat associated with the Project, compensation for the loss of habitat would reduce the overall impact on the affected area(s) (see response to IR-101/Conformity DFO-3). For clarity, the following text will be added to Section 9.2.3.2 of the EIS: "Final layout and well template locations have yet to be finalized. A combination of single wells or multi-well templates (4-slot, 6-slot and/or 8-slot) will be drilled. Modelling considered the worst-case scenario for highest cuttings deposition, an 8-slot well template. Based on the drilling of 8-slot well template at a single location, the maximum extent of drill cuttings deposition for 1.5 mm was within 200 m from the source. ***Conservatively, if a 400 m radius from the center of a template was assumed, the zone of influence per template would be approximately 0.5 km². Assuming five templates, the total zone of influence for and subsea infrastructure would be 7.5 km².*** ~~Therefore,~~ Using the potential subsea layout (Section 2.5.3.2), should an 8-slot well template be drilled anywhere within the Core BdN Development Area, cuttings deposition would likely remain within the boundaries

	of the Project Area and there is little or no potential for these environmental releases from individual wells or multiple wells to interact or accumulate beyond the Project Area…"

IR-209 **DFO-103**	**Guideline Ref:** Part 2, Section 7.3.8.3; Section 7.6.3	**EIS Ref:** Section 12.4.1; Section 15.5.1
Context/Rationale	Section 12.4.1 of the EIS predicts no significant residual effects. This conclusion is based on the criteria for significance as for fish and fish habitat, which have a high threshold of harm in area, duration and population level effects before they are considered significant. Special areas need to be assessed using metrics based on the criteria that make them special (i.e. the objectives of the closure or designation). An area that is protected because of vulnerability to disturbance needs to be assessed on the amount of biological protection that it offers and the further potential for disturbance predicted for the Project. An area that is protected for its productive capacity needs to be assessed based on the potential to reduce or alter that capacity. Although the Proponent has indicated that none of the effects on marine fish and fish habitat, marine and migratory birds and marine mammals and sea turtles are predicted to be significant (page 12-33) and that mitigation measures outlined for these VCs will reduce or eliminate environmental effects on the defining features of special areas (page 12-34), it is important to consider how EBSAs are determined. EBSA identification is considered a relative process, not an absolute one – sites are considered more or less significant when compared to one another, based on the biological and ecological properties of these areas, and not the perceived threats and risks to those sites. "Significant" means if the area or species were perturbed, the ecological consequences would be greater than an equal perturbation of most other areas. "Value" to humans is not a major consideration in identification (DFO 2004). Similarly, the metrics used to assess the potential for cumulative effects on special areas are not appropriate. The proponent recognizes that "direct or indirect changes…from Project related activities… may affect the key environmental characteristics and processes that define and distinguish these areas" and these special areas are designated for "conserving the presently pristine nature of" or "help prevent further damage to already affected and sensitive environmental features and components." However, the Proponent does consider metrics that quantify potential effects on key characteristics and processes or related to the stated objectives of the special area designation (e.g., productive capacity, area, protected vs area damaged etc.). The Bay du Nord Project has the potential to further damage areas that were previously damaged but are now protected from damage by other human activities. This cumulative effect needs to be assessed as it may significantly affect the integrity and function of the protected areas in question. The use of appropriate metrics for assessment will also provide metrics to be used for the proposed EEM program for the Special Areas VC.	
Request **15-Apr-19**	A. Revise Section 12.4.1 of the EIS using the appropriate metrics and criteria for special areas. B. In Section 15.5.1 of the EIS update the cumulative effects assessment using appropriate metrics and in consideration of the fact that previously damaged areas are now protected from other human activities.	

Equinor Response 15-Nov-19	A. The Project Guidelines indicate that the effects assessment for Special Areas should include change to habitat quality, impairment of ecosystem functioning and change to environmental features that define special areas. The effects assessment in Chapter 12 uses Change in Environmental Features and/or Processes, which encompasses those potential changes identified in the Guidelines and also addresses Change in Human Use and/or Societal Value related to special areas. As indicated in response to IR-149/DFO-144b, the amended Chapter 12 can be found in Appendix G to this Response Document. B. The EIS Guidelines indicate that the effects assessment for Special Areas should include change to habitat quality, impairment of ecosystem functioning and change to environmental features that define special areas. The effects assessment in Section 15.5 uses Change in Environmental Features and/or Processes, which encompasses those potential changes identified in the Guidelines and also addresses Change in Human Use and/or Societal Value related to special areas. Project activities will occur within the identified special area, the Northwest Flemish Cap (10) FCA, which is now closed to bottom trawling fishing activities. As stated in IR-208/DFO-102, the estimated zone of influence from Project activities in the Northwest Flemish Cap (10) FCA is approximately 1.7 km². This represents 1.3 percent of the FCA within the Core BdN Development Area that could be affected by Project activities, or 0.5 percent of the total area of the FCA. The EIS is complete, no additional information is required.

IR-210 **DFO-104**	**Guideline Ref:** Part 2, Section 7.3.8.3	**EIS Ref:** Section 12.4.1
Context/Rationale	Section 12.4.1 of the EIS states “A number of Planned Project activities may result in injury or mortality to benthic species, but the introduction of hard surfaces may result in benefits through increased colonization.” (page 12-33) This statement does not appear to be supported given that there has been no quantification of the impacts on benthic species compared to the benefits of the introduction of hard surfaces.	
Request 15-Apr-19	Provide the justification or rationale for the statement in Section 12.4.1 of the EIS regarding the introduction of hard surfaces s.	
Equinor Response 15-Nov-19	Section 9.2.2.1 of the EIS provides information regarding the influence of introduced hard surfaces to invertebrate community structure, species diversity and abundance. For additional clarity see responses to IR-108/DFO-80 and IR-112/DFO-81a; CEAA-41. For clarity the following text will be added to Section 12.4.1 of the EIS: “A number of planned Project activities may result in injury or mortality to benthic species, ***but the introduction of hard surfaces may result in benefits through increased colonization. As discussed in Section 9.2.2.1***, ***the presence of subsea infrastructure (i.e., anchors, well templates, risers) and potential protection measures (e.g., rock placement, wellhead protection, concrete mattresses) may increase local habitat complexity through availability of hard structures for colonization by sessile species and shelter for mobile fish and invertebrate species. Changes to benthic communities would be dependent on a variety of factors including local biotic communities, depths, oceanographic processes, structure design and configuration, material composition.”***.	

IR-211 DFO-149	**Guideline Ref:** Part 2, Section 7.3.3	**EIS Ref:** Section 12.2.5.1
Context/Rationale	In Section 12.2.5.1 of the EIS, the determination of the 30 kilometre threshold for behavioural response criteria to impulsive sounds is not clear.	
Request **15-Apr-19**	Incorporate results of acoustic modelling in Appendix D to explain how 30 kilometres was selected in Section 12.2.5.1 of the EIS.	
Equinor Response **15-Nov-19**	Section 12.2.5.1 of the EIS states "Also, acoustic modelling conducted for the EIS indicates that sound levels (at distances beyond 30 km) from the representative air-source array will be below the recommended behavioural response criteria for impulsive sounds." As described in Section 11.2.5.1 and shown in Table 11.5, estimated sound levels do not exceed 160 dB rms at distances ranging from 7.5 km to 20.1 km (depending on time of year and modelling site location; see also Table 6 in Appendix D). Based on acoustic modelling for the 160 dB rms behavioural threshold for marine mammals for impulsive sounds from the airgun array, the 30 km distance is considered conservative. Updates to the EIS are not required.	

IR-212 DFO-142	**Guideline Ref:** Part 2, Section 7.1.9.2, Section 7.3.8.2	**EIS Ref:** Chapters 7 & 13
Context/Rationale	DFO is guided by federal privacy regulations. DFO data custodians provide commercial fishers data to external clients in a format that will ensure privacy guidelines are maintained. In the EIS document the redaction of domestic fishing data appears to have resulted in an under estimate of commercial fishing activity in the Local Study Area (LSA). The proponent should work with data providers to ensure that accurate totals of commercial fishing activity (by geographic area) are presented including the sub-set of redacted data by species. This will ensure a full accounting of commercial activity is reported.	
Request **15-Apr-19**	Update baseline information and effects assessment, as necessary in Section 7 and 13 of the EIS.	
Equinor Response **15-Nov-19**	The EIS provides cautionary language in Section 7.1.2 that the data presented have been redacted based on Federal protection of privacy legislation. While full data sets for 2011 to present were requested from Economic Analysis and Statistics (Statistics Services) in Ottawa in 2017, the data delivered (quantity and value and geolocational sets) are those permitted to be provided to private-sector users under DFO policy as guided by the *Canadian Privacy Act*, according to DFO Ottawa. For all recent environmental assessments based on similar requests a similar data set, with all the privacy redactions, has been provided by DFO. The baseline information in Chapters 7 and 13, from which effects assessment was carried out, was provided by DFO. Updates to the EIS are not required.	

IR-213 DFO-143	**Guideline Ref:** Part 2, Section 7.1.9.2	**EIS Ref:** Section 7.1.5, Figure 7.15
Context/Rationale	Section 7.1.5 of the EIS provides an incomplete perspective of the international fisheries on the nose and tail of the Grand Bank and Flemish Cap. Figure 7.15 in particular, and Section 7.1.5 in general provide a very limited perspective of the fishing activities on the	

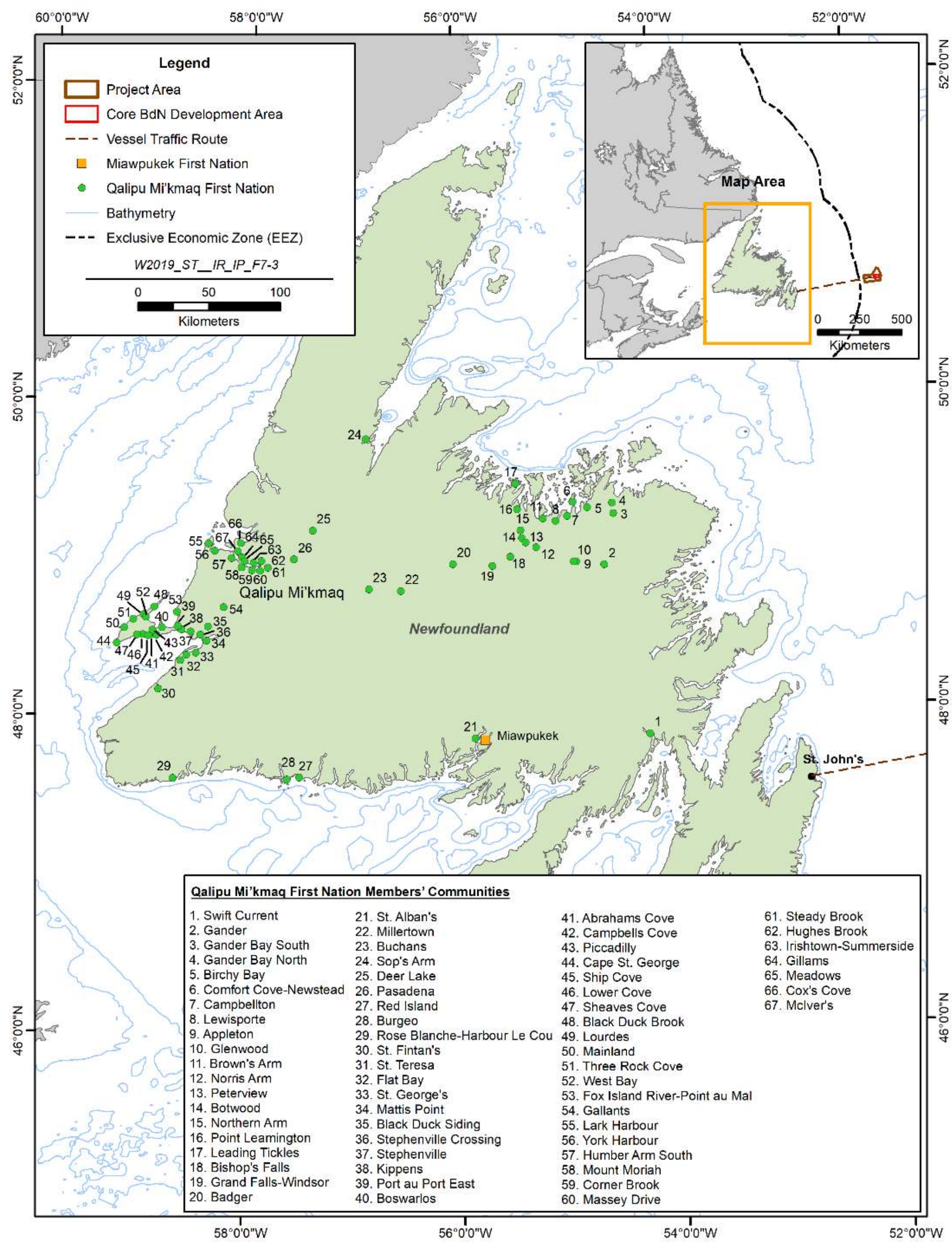
	Flemish Cap. For example, the Significant Adverse Impact assessment of fishing activities on VMEs tabled at NAFO Scientific Council in 2016 (NAFO 2016) provides a more complete description of fisheries in the NAFO Regulatory Area (NRA). The omission of this type of information biases the perception of fisheries in the Project Area, and prevents performing a reliable assessment of the risks associated with this Project.
Request 15-Apr-19	A. In Section 7.1.5 of the EIS provide comprehensive information on international fisheries on the nose and tail of the Grand Bank and Flemish Cap. B. Update effects assessment, as necessary.
Equinor Response 15-Nov-19	The EIS will be updated to include additional information regarding international fisheries. The following text will be added to Section 7.1.5 of the EIS (following Figure 7-14) (note the referenced Table 7.5 can be found after the “References”, below): ***“Table 7.5 provides an overview of key international fisheries in or near the Project Area, summarized by NAFO Division and general water depths. Information is derived from NAFO 2016c, Annex VIII.***” These species/fisheries were understood to be part of the existing environment (see Section 7.1.5 and Section 7.1.6). The addition of this information does not change the conclusions of the EIS. Additional updates to the EIS are not required. References: ***NAFO (Northwest Atlantic Fisheries Organization). 2016c. Report of the Scientific Council Meeting 03 -16 June 2016, Halifax, Nova Scotia. NAFO SCS Doc. 16 (14 Rev), Serial N6587. Available at https://www.nafo.int/Portals/0/PDFs/sc/2016/scs16-14.pdf***

Table 7.5 Key NRA Fisheries by Division and Depth

NAFO Divisions and Depths	Key Species Fisheries	Details
Divisions 3NO at <800 m	***Witch flounder***	***A directed fishery for witch flounder was re-opened in 2015 for the first time since it was placed under a moratorium in 1995. This fishery is conducted with 130 mm mesh size and is likely to occur at various depths to 800 m.***
Divisions 3LNO at 200-1000 m	***Redfish***	***The redfish fishery is conducted with 130 mm mesh size trawl bottom trawls with the primary areas being the slope area of Division 3O, the east-central area of Division 3N and the southeast area of Division 3L near the border with Division 3N in depths <600m. Redfish comprise 90 percent of the catch and the main by-catch species were American plaice (2 percent), cod (2 percent), silver hake (2 percent) and Atlantic halibut (2 percent) based on 2015 logbook information. Although mid-water trawling has comprised a significant percentage of redfish fisheries for principal Russian fleet in the past, its use has diminished in recent years and only bottom trawls were deployed in 2013-14.***
	Shrimp	***The shrimp fishery was closed to directed fishing in 2015. When active, it was conducted with 40 mm mesh size bottom trawls in Division 3L, primarily concentrated in an area along the central eastern slope in depths between 300 and 500 m with shrimp comprising 99 percent of the catches.***
Divisions 3LMNO at >800 m	***Greenland halibut***	***The principal fishery is conducted from 800-1400 m with 130 mm mesh size bottom trawls and although widespread throughout the divisions, there were four primary areas. These included, in decreasing area of importance: (1) the northeast of Division 3L, (2) the northwest of Division 3M, (3) the southeast of Division3L along the Division3LM boundary, and (4) the northeast of Division 3N. Greenland halibut comprised 95 percent***

		of the catch based on 2015 logbook data and main by-catch are grenadiers, witch flounder, skates and plaice (each species <1 percent).
Division 3M at 150-600 m	***Shrimp***	***The shrimp fishery has been under moratorium since 2012 but previous fisheries were conducted with 40 mm mesh size bottom trawls primarily in depths between 300 and 500 m. Shrimp comprised 98 percent of the catches with redfish as main by-catch (2 percent).***
	Redfish	***The redfish fishery is conducted with 130 mm mesh size bottom trawl gear primarily within the 200m-600 m depth zone in Division 3M along the southern and north-western slope of the bank. Redfish comprise 80 percent of the catch and the main by-catch species were Greenland halibut (4 percent) and cod (3 percent).***
	Cod	***The cod fishery in Division 3M is conducted with 130 mm mesh size bottom trawl gear at depths between 150 to 550 m, with the highest concentrations of effort in the south western and south-eastern areas of the slope of the bank. Most of the hauls were carried out at depth between 300-400 m. Cod comprised 92 percent of the catches and the most important species in the by catch was redfish (7 percent). A long-line fishery is also conducted for cod between 200 and 400 m in the north west portion of the NAFO Footprint area along the slope of the bank. The principal by-catch in this fishery is skate and Greenland shark.***
Divisions 3LNO at >30 m	***White hake***	***The white hake fishery operates mostly along the shelf edge of the southern part of NAFO Division 3NO and tends to be an opportunistic fishery and therefore can be quite irregular. The fishery uses 130 mm mesh size bottom trawl gear.***

IR-214	**Guideline Ref:** Part 2 Section 7.1.8	**EIS Ref:** Section 7.3.2, Figure 7-52
DFO-18		
Context/Rationale	In Section 7.3.2 of the EIS, Ship Cove (Conception Bay) that has been identified on the map is not a member community of QMFN. The Ship Cove that should be identified on the map is located on the Port au Port Peninsula, between Abrahams Cove and Lower Cove.	
Request **15-Apr-19**	Update map to include the correct Ship Cove in Section 7.3.2 of the EIS.	
Equinor Response **15-Nov-19**	Figure 7.52 will be revised to include the correct Ship Cove, which will be represented by community number 45 on the revised figure (see below).	



IR-215	**Guideline Ref:** Part 2, Section 7.1.9.2, Section 7.3.8.2	**EIS Ref:** Chapters 7 and 13
DFO-17		
Context/Rationale	Throughout Sections 7 and 13 of the EIS, Equinor should provide detailed references outlining the source of the data used including from whom it was requested and subsequently delivered as well as the timing of delivery *(e.g. DFO Statistics Branch Ottawa, requested June 13th, 2017 delivered July 25th 2017)*. Such documentation will enable DFO reviewers to more accurately replicate and thus adjudicate data presented in the EIS documents.	

Request 15-Apr-19	Provide detailed references for fisheries source of data used.
Equinor Response 2-May-19	Equinor Canada provided the following response to this IR in May 2019. *Fish catch data are always obtained from DFO Stats Branch, following DFO required protocol. Per email sent from K. Coady to S. Belford (March 15, 2019), the details regarding when the information was requested, and by whom, and the date received was provided. The same protocol was followed when requesting similar information for the Flemish Pass EIS (S. 7.1.3 to 7.1.6, Equinor 2017) without receiving comments from DFO. This level of detail is not required in the EIS since DFO required protocols were followed.*
DFO Response 10-Jun-19	Response is adequate.

IR-216 **CEAA-95**	**Guideline Ref:** Part 2, Section 7.1.9.2, Section 7.3.8.2	**EIS Ref:** Section 13.1.5.2
Context/Rationale	In Section 13.1.5 of the EIS, a compensation program for international fishers was not described. According to DFO, there are eight to nine commercial foreign fishing vessels year round in the area from various nations and scientific fisheries surveys.	
Request 15-Apr-19	In Section 13.1.5 of the EIS clarify if compensation planning includes international fishers.	
Equinor Response 15-Nov-19	The statement in Section 13.1.5.2 of the EIS does not exclude compensation for foreign fishing vessels. As stated, the program will be developed in consideration of the C-NLOPB's guidelines, which are founded on the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act*. The Accord Acts, Sections 161(1) and 161(2) identify liability for actual loss or damage incurred by "any person" without limiting the national origin of claimants. Updates to the EIS are not required.	

IR-217 **DFO-151**	**Guideline Ref:** Part 2, Section 7.3.8.2, Section 7.3.8.4	**EIS Ref:** Section 13.1.5. Table 13.2
Context/Rationale	In Table 13.2 of Section 13.1.5 of the EIS, row one, the loss of survey areas could alter information available for fisheries management and research studies.	
Request 15-Apr-19	Update Table 13.2 of Section 13.1.5 of the EIS to reflect potential alteration of information for fisheries management and research studies. Update effects assessment, as necessary.	
Equinor Response 2-May-19	Equinor Canada responded to this IR in May 2019. The following information was provided: *This information is provided in the EIS. Row 1 of the table addresses this – first bullet lists "Loss of access to localized marine areas" Text preceding the table and text in Section 13.4.1 explicitly includes science studies in the assessment. E.g. Section 13.4.1 says "Although some fisheries activities (including science surveys) have a potential to be affected by Project activities depending on their location and timing..."*	
DFO Response 10-Jun-19	Response is adequate	

IR-218 **DFO-152**	**Guideline Ref:** Part 2, Section 7.3.8.2, Section 7.3.8.4	**EIS Ref:** Section 13.1.5. Table 13.3
Context/Rationale	In Table 13.1 of Section 13.1.5 of the EIS does not include lighting, waste discharges or presence of installation effects on commercial fisheries and other ocean users. Lighting would likely impact many pelagic spp. and sound could have even broader impacts. Discharge and installation would also have some level of impact.	
Request **15-Apr-19**	A. Ensure that all interactions are noted and that the effects assessment includes all interactions and pathways. B. Ensure consistency between tables and effects assessment information in the text.	
Equinor Response **15-Nov-19**	A. Equinor Canada disagrees with the reviewer's that certain interactions are not considered in the effects assessment. For instance, regarding FPSO presence, Section 13.2.2 of the EIS states "The primary interactions during production and maintenance operations with Commercial Fisheries and Other Ocean Uses are the presence of the FPSO and subsea infrastructure and the anti-collision zones." As indicated in responses to IR-13/CEAA-6;DFO-1 Part H and IR-151/DFO-91, in accordance with Section 3.2 of the EIS Guidelines, the effects assessment of project activities was based on those discharges/activities "which have the greatest potential to have environmental effects." Therefore, the effects assessment for commercial fisheries is focused on those Project activities/discharges which would interact with commercial fisheries. Activities/discharges that may interact with fish and fish habitat, and which were determined to be negligible to low and not likely to result in significant adverse effects are not included as interactions. For instance, Chapter 9 concluded that there would be no significant residual adverse effect from routine discharges on marine species. Lighting, while it may attract some species and result in a positive reef effect as discussed in Section 9.2.2.1, it would not be expected to have a consequent interaction with fish harvesting activities nor affect harvesting success. For clarity, the following text will be added to Section 13.1.5 to further explain the interactions identified in Table 13.3. ***"In accordance with Part 2, Section 3.2 of the EIS Guidelines, the effects assessment of project activities is based on those discharges/activities "with the greatest potential to have environmental effects." This is based on scientific literature, research studies, Indigenous knowledge, input from Indigenous groups and stakeholders, and professional experience of the EIS team. The principal types of potential interactions between routine Project activities and Commercial Fisheries and Other Ocean Uses are physical or logistical, such as interference with or displacing fish harvesters or other shipping, or fishing gear conflicts (snagging) with towed equipment. Sound emissions from geophysical surveys are also a potential source of interaction with fishing (scaring fish away from gear) as indicated in Table 13.3. Other potential interactions (e.g., lighting and potential attraction of fish) are negligible or very minor, and therefore are not identified as interactions with fish harvesting or other marine activities."*** B. The EIS was reviewed and all interactions identified in 13.3 are addressed. Updates to the EIS are not required.	

IR-219	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Chapter 15.0
Conformity DFO-4 CEAA		
Context/Rationale	In Section 3.2 of the EIS Guidelines "environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other physical activities that have been or will be carried out." Further guidance in Section 7.6.3 of the EIS Guidelines states that "Cumulative effects may result if the implementation of the project may cause direct residual adverse effects on the VC…". The cumulative effects assessment only considers the potential for overlap of the project's residual environmental effects with those of other projects. Although not specified in the methods section, only those residual effects deemed significant were considered. Thus, the potential for additive or synergistic interactions with other projects were ignored. Similarly, as only significant residual effects are considered, the proponent did not examine within-project cumulative effects (e.g., up to 40 wells, geophysical/seismic surveys conducted in support of potential future development). Only the effects of a single well or an eight well template were modelled and assessed. Because the deposition of drilling wastes is predicted to have a very limited footprint no significant residual effects were anticipated. As a result, the cumulative project footprint of these wastes is not considered along with the eventual fate of the considerable quantity of fine particulates that are transported outside the model domain. By only assessing residual environmental effects deemed significant, the proponent does not consider the cumulative effects of many wells in the CBdN and PA, which perpetuates the potential for habitat destruction as "death by a thousand cuts" (Laurence 2010). Recommend a section be created within Section 15.0 that deals with the within project cumulative residual effects.	
Request 15-Apr-19	Update the EIS to include a cumulative effects assessment of the Project itself from simultaneous operations and multiple sources of drill wastes, discharges and emissions throughout the production field.	
Equinor Response 15-Nov-19	Equinor Canada does not agree that the EIS is in non-conformance with the EIS Guidelines as suggested by this Information Request. The cumulative effects assessment presented in Chapter 15 of the EIS was undertaken using the CEA Agency guidance and OPS on cumulative effects, per the requirement of the EIS Guidelines and it is the opinion of Equinor Canada that the requirements of the EIS Guidelines regarding cumulative effects has been met. Per Subsection 19(1)a of CEAA 2012, the environmental assessment is to include a consideration of the environmental effects of a project, including "*cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out*." Thus, cumulative effects is the assessment of Project effects and effects from other activities (past or future). It is not an assessment of intra-project effects. Intra-project effects assessment is the assessment of project effects, which is clearly presented in Chapters 9 through 17 of the EIS. The determination of significance for each VC considers intra-project effects. For example, Section 9.5.2 states *"The overall nature and characteristics, localized extent and long-term duration of the various planned components and activities associated with this Project, along with the offshore and dynamic marine environment involved and the planned implementation of standard and effective mitigation measures, the Project is not likely to result in significant residual adverse effects on Marine Fish and Fish Habitat.*	

	Although Project-related components, activities and emissions may result in some localized, short-term interactions with fish and fish habitat in parts of the LSA, the number of individuals and habitat areas that may be affected, and the temporary and reversible nature of these interactions, means that the Project will not have overall ecological or population-level effects and will not result in detectable decline in overall fish abundance or changes in the spatial and temporal distributions of fish populations within this area." This determination is based on the intra-project effects of all discharges, emissions, etc., from all project activities. While each Project activity may be analyzed separately in the chapter sections, the overall determination of significance on each VC includes an assessment of all project activities together. A discussion of the residual effects for each VC is included in Chapter 15 (refer to sections 15.2.2, 15.3.2. 15.4.2, 15.5.2, 15.6.2 and 15.7.2) that specifically addresses the project-related contributions to cumulative effects. There were not any significant residual effects identified for any of the VC's assessed in the EIS (refer to Section 18.3: *"With the implementation of proposed mitigation measures (refer to Table 18.2), residual adverse environmental effects of routine Project activities and components are predicted to be not significant for all VCs."*), thus residual effects discussed in the above-referenced sections were considered "not significant". Equinor Canada disagrees with the reviewer's statement "Similarly, as only significant residual effects are considered…" Chapter 15 clearly states that the cumulative effects assessment is based on residual project effects, regardless of their significance ratings. Throughout Table 15.1, which identifies the environmental components to be included in the cumulative effects assessment, statements such as "Potential for residual (but not significant) environmental effects as a result of the Project, which may contribute to cumulative effects." Similarly, in Section 15.1.4 it is stated "*In cases where predicted residual adverse environmental effects of the Project on the VC have potential to accumulate or interact with those of one or more other projects or activities (regardless of the significance of the individual residual adverse effects potentially associated with the Project and the other projects and activities), the potential cumulative effects of the Project in combination with these other activities are assessed and evaluated."* Therefore, the cumulative effects assessment was not limited to only significant residual effects. Per the CEA Agency guidance "Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act, 2012* (March 2018) and the Operational Policy Statement "Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act, 2012*" (updated March 2015) it is clear that cumulative effects assessment is based on the interaction of the Project -related effects in combination with other past or planned activities. Per the CEA Agency guidelines and OPS, cumulative effects "*are those that are likely to result from the designated project in combination with other physical activities that have been or will be carried out. Cumulative effects may result if:* • *the implementation of the project may cause direct residual adverse effects on the VC, taking into account the application of technically and economically feasible mitigation measures; and (emphasis added),* • *the same VC may be affected by other past, present and future physical activities"* Therefore, cumulative effects assessment is the assessment of effects from the Project in combination with effects from other activities. Information regarding past drilling activities will be provided in Table 15.3. See response to IR-220/Conformity DFO-5.

	In summary, the cumulative effects assessment presented in Chapter 15 was undertaken using the CEA Agency guidance and OPS on cumulative effects, per the requirement of the EIS Guidelines and it is Equinor Canada's opinion that the requirements of the EIS Guidelines regarding cumulative effects has been met. While it was indicated at the Regulatory Review Workshop (May 2019) that the EIS would be amended, based on further review of the information in the EIS and as discussed in this response, Equinor Canada is of the opinion that the EIS is complete and updates to the EIS are not required.

IR-220	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.1.3
Conformity DFO-5		
Context/Rationale	The EIS Guidelines state that "Cumulative effects are those that are likely to result from the designated project in combination with other physical activities that have been or will be carried out". However, the EIS states that projects whose temporal scope expires in 2019 are not considered within the assessment. As a result, the potential for cumulative effects of the 15 wells already drilled in the PA (8 in the CBdN) are not evaluated. Consequently, the Proponent does not present any monitoring information (compliance or EEM) from these past activities that would support the determination that they had no residual effect on the environment	
Request **15-Apr-19**	In Section 15.1.3 of the EIS, include the effects of past drilling projects as part of the cumulative effects assessment or provide the rationale for the exclusion of past drilling projects in the Project Area as part of the cumulative effects assessment which is contrary to what is indicated in the EIS Guidelines.	
Equinor Response **15-Nov-19**	Equinor Canada has drilled 16 wells in the Flemish Pass area. Most of these wells were drilled within the boundaries of the BdN Project Area, as illustrated on in the Figure provided for in response to IR-72/DFO-69. Between 2009 and 2017 there were 16 exploration and delineation wells, including side-tracks drilled in the Project Area. During the 2018 Seabed Survey multibeam echo sounder (MBES) and side scan sonar (SSS) data were collected for a large portion of the Core BDN Development Area. The survey area included four previously drilled exploration wellsite. Assessment of the MBES/SSS data provided an estimate of the spatial extent of anomalies on the seafloor. It is assumed that anomalies around previously drilled well sites are drill cuttings deposition as none of these sites required post-drilling monitoring. Based on these data, drill cutting deposition ranges from 80 m to 350 m from the wellsite (Fugro 2019). Table 15.3 will be amended as follows to include previous exploration drilling in the Project Area.	

Table 15.3 Overview of Past, Present, and Future Projects and Other Physical Activities Considered in the Cumulative Effects Assessment

Project / Activity	Overview
Offshore Petroleum Exploration – Drilling	• The eastern NL offshore area is subject to ongoing and planned future exploration drilling programs which were in progress, subject to EA review, or recently approved as of the time of writing (see *http://www.cnlopb.ca/assessments*) and are listed in Table 15.2. • As of January 3, 2019, a total of 470 wells have been drilled in the Canada-NL Offshore Area, including 171 exploration wells, 57 delineation wells, and 242 development wells (C-NLOPB 2019b). • Over the three-year period of 2016 to 2018, seven wells were drilled (or re-entered) in the eastern NL and Jeanne d'Arc Basin C-NLOPB land tenure areas, including four exploration / delineation wells (C-NLOPB 2019b). • It is likely that exploration drilling programs will extend throughout the temporal duration of this Project. • 16 wells, including side tracks, were drilled by Equinor Canada in the Project Area. • Multibeam echo sounder and side scan data collected in 2018 in the Core BdN Development Area provide an estimate of cuttings deposition for four well-sites surveyed in 2018. Cuttings deposition (at greater than 15 cm resolution) is estimated to range from 80 m to 350 m from a well site. Sampling was not undertaken to determine if these areas were drill cuttings. • Exploration drilling could be carried out on exploration licences within the BdN Project Area held by Equinor Canada (i.e., EL 1143, EL 1154, EL 1156)

For clarity the following text will be included in Chapter 15:

Section 15.2.3

"Drilling activities have potential effects on Marine Fish and Fish Habitat from burial, smothering, and ingestion from suspended particles and sedimentation as described in Chapter 9. As described in other environmental assessments for exploration drilling programs drill cuttings dispersion is mainly localized to within 1 km from the wellhead (Nexen 2018, Statoil 2017).

Previous exploration drilling in the Project area (Table 15.3) may contribute to cumulative interactions on fish habitat in combination with proposed Project related interactions (e.g., installation of subsea infrastructure and modelled drill cuttings deposition). However, given the localized nature of Project interactions with the benthic environment and the localized nature of previous drilling interactions, and the implementation of mitigation measures, the Project is unlikely to result in significant adverse cumulative environmental effects."

Section 15.5.4 – see response to IR-223/DFO-154.

References:

Fugro 2019. ST18504 Seafloor and Shallow Subsurface Survey Bay du Nord Development, Flemish Pass. Fugro Project No. 20180024-RPT-002 Rev 0.

IR-221 **DFO-140**	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.1.3, Figure 15-1
Context/Rationale	Figure 15-1 in Section 15.1.3 of the EIS, is unclear what "Fishing Intensity All Species-2016" represents.	
Request **15-Apr-19**	Describe fishing intensity in Section 15.1.3. Is this based upon effort (fishing days, CPUE) or catch rates? Explain the meaning of the numbers	

Equinor Response 2-May-19	Equinor Canada responded to this IR in May 2019. The following information was provided: *Fishing intensity is described in Section 7.1.2 (page 7-4) of the EIS.*
DFO Response 10-Jun-19	Response is adequate

IR-222 / **DFO-105**	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.1.3; Section 15.5.5
Context/Rationale	The proponent considers that the effects of past activities (fishing, exploratory drilling etc.) constitute part of the baseline environment (Section 15.1.3) and that the project itself will not contribute to further degrade or disturb the environment. This view is confusing given that significant portions of the CBdN and the PA are special areas that merit protection from disturbance. Section 15.5.5 of the EIS concludes that" the project is not likely to result in significant adverse environmental effects on Special Areas in combination with other projects or activities that have been or will be carried out.". The proponent did not assess the existing effects of past projects, only noted that they exist and may have had an effect (fishing, exploratory drilling was considered not significant) on the special areas.	
Request 15-Apr-19	A. In Section 15.1.3 of the EIS provide justification for the view that the project will not further degrade/ disturb the environment, considering the presence of special areas. B. In Section 15.5.5 of the EIS provide a cumulative effects assessment for special areas.	
Equinor Response 15-Nov-19	A. See Response to IR-220/Conformity DFO-5 and IR-223/DFO-54. B. See response to IR-223/DFO-154 regarding updates to the cumulative effects assessment for special areas and previous exploration drilling. Section 15.5.5 of the EIS provides the assessment of cumulative effects on special areas in accordance with the EIS Guidelines and the CEAA guidelines "Assessing Cumulative Effects under the Canadian Environmental Assessment Act, 2012" regarding cumulative effects. The assessment is based on available information on benthic environments such as those found in special areas within the Core BdN and Project Areas, including the Northwest Flemish Cap (10) NAFO FCA. Post exploration drilling monitoring was not a requirement for wells drilled in the Flemish Pass area, therefore such data is not available.	

IR-223 / **DFO-154**	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.1.3; Table 15.2; Section 15.5, Section 15.5.3, Figure 15-2
Context/Rationale	Table 15.2 of Section 15.1.3 of the EIS provides information related to potential spatial and temporal overlap between the Project and other physical activities including exploration drilling and production projects; however, not all exploration projects identified are included in the discussion for Special Areas. For example, BP Canada Energy Group Orphan Basin Exploration Drilling Program (2017 to 2026) is listed in Table 15.2, but this area is not shown on Figure 15-2. The majority of the activity associated with BP's project is located in the Northeast Newfoundland Slope Marine Refuge, which also intersects with the LSA for this EIS.	

Request
15-Apr-19

A. Provide accurate description of spatial and temporal overlap of potential effects of the proposed project and effects of each of the past, present and future exploration and production projects in Section 15.5 of the EIS.

B. Ensure Figure 15-2 incorporates relevant Projects and associated Exploration Licences.

Equinor Response
15-Nov-19

A. The spatial and temporal boundaries for cumulative effects assessment are described in Section 15.1.2 of the EIS.

As indicated in response to IR-220/Conformity DFO-5, previous exploration drilling activities will be included in Table 15.2. Estimates for zone of influence from Project subsea infrastructure and cuttings dispersion is provided in response to IR-208/DFO-102.

The following amendments will be made to Section 15.5.4 of the EIS.

> ***"Twenty-five Special Areas intersect with the LSA and are listed in Table 15.12. Three Special Areas intersect with the CBdN and seven intersect with the Project Area."***

Table 15.12 Special Areas Intersecting with ~~Project Area~~ ***LSA***

Special Area	CBdN	PA	*LSA*
Canadian Ecologically and Biologically Significant Areas (EBSAs)			
Northeast Slope	–	–	***Intersect***
Eastern Avalon	–	–	***Intersect (TR)***
Baccalieu Island	–	–	***Intersect (TR)***
Marine Refuges			
Northeast Newfoundland Slope Closure	–	–	***Intersect***
Significant Benthic Areas (SBAs)			
Sea Pens	–	–	***Intersect***
Large Gorgonian Corals	–	–	***Intersect (TR)***
Canadian Fisheries Closures (FCA) within the EEZ			
Near Shore (2 zones)	–	–	***Intersect (TR)***
National Historic Sites			
Cape Spear	–	–	***Intersect (TR)***
Signal Hill	–	–	***Intersect (TR)***
EBSA (UN Convention on Biological Diversity)			
Slopes of the Flemish Cap and Grand Bank	***Intersect***	***Intersect***	***Intersect***
V***ulnerable*** Marine E***cosystems***			
Sponge (3 areas intersect PA, 6 intersect LSA)	–	***Intersect***	***Intersect***
Sea Pen (2 areas intersect LSA)	***Intersect***	***Intersect***	***Intersect***
Large Gorgonian Coral		***Intersect***	***Intersect***
~~Sackville Spur~~	–	***Intersec~~X~~***	***Intersect***
~~***Northern Flemish Cap***~~	–	–	***Intersect***
~~***Northern Shelf and Slope (within Canadian EEZ)***~~	–	–	***Intersect***

NAFO FCA			
Sackville Spur (6)	–	–	***Intersect***
Northern Flemish Cap (9)	–	–	***Intersect***
Northwest Flemish Cap (10)	***Intersect***	***Intersect***	***Intersect***
Northwest Flemish Cap (11)	–	–	***Intersect***
Northwest Flemish Cap (12)	–	–	***Intersect***
Important Bird Areas (IBA)			
Quidi Vidi Lake	–	–	***Intersect (TR)***

"These Special Areas are located at distances of approximately 60 km to ***nearly 1,000 km*** away from the offshore petroleum production projects that are currently operating in the RSA (i.e., Hibernia, Terra Nova, White Rose, and Hebron). The Core BdN Development Area ***and the Project Area intersect with Special Areas*** ~~and Project Area intersects with three Special Areas,~~ but none of the other offshore petroleum production projects overlap with Special Areas in the offshore, meaning that there will be no direct cumulative effects from this Project and other offshore petroleum production projects on the benthic environment of these Special Areas.

There is potential for cumulative interactions on Special Areas intersecting the Core BdN Development Area resulting from previous exploration drilling in the Core BdN Development Area in combination with the Project activities (installation of subsea infrastructure and development drilling). As indicated in Section 9.2.3.2, subsea infrastructure and potential zone of influence from cuttings deposition is estimated to occupy 7.5 percent of the Core BdN Development Area. Within the fisheries closure area Northwest Flemish Cap (10), the zone of influence from subsea infrastructure and drill cutting deposition is estimated to be approximately 0.05 percent of the FCA. Given the localized nature of Project-related interactions, in combination with the localized effects of previous exploration drilling on Special Areas, and the conclusion that the Project will not have a significant effect on these Special Areas, potential cumulative interactions are similarly anticipated to be localized and unlikely to result in significant adverse cumulative environmental effects.

Various ELs (e.g., EL1134, EL 1135***, EL 1138, EL 1139***, EL 1140, EL 1141, EL 1142, EL1143, ***EL 1144,*** EL1145, ~~EL 1146, EL 1148, EL 1149~~ ***EL1150, EL 1154,*** EL 1156, ***EL 1157, EL 1158, EL 1159***) ~~in the Flemish Pass~~ intersect with Special Areas, especially the Slopes of the Flemish Cap and Grand Bank UNCBD EBSA, which is an extensive area. ***The Project LSA and seven ELs intersect with the Northeast Newfoundland Slope Closure Marine Refuge. Thus, exploration drilling activities carried out in these ELs (i.e., EL 1138, EL 1145, EL 1146, EL 1148, EL1157 and EL 1158) in combination with the Project could result in cumulative effects on the Northeast Newfoundland Slope Closure Marine Refuge. However, the minimum distance of the Project area to the Northeast Newfoundland Slope Closure Marine Refuge is approximately 34 km.*** Due to the localized ~~small~~ footprint of drilling activities ***predicted for the BdN Project***, the zone of influence for drilling cuttings deposition (i.e., 200 m), and safety zones (i.e., 500 m) around installations, cumulative effects ***from the Project in combination with exploration drilling activities*** are not anticipated.

There is potential for cumulative effects from Project aircraft and vessel traffic and similar activities related to other projects as well as general marine traffic, fishing and oil and gas exploration activities in these special areas. The identified special areas include two Snow Crab Stewardship Exclusion Zones in the Near Shore Crab Fishing Area, which are closed to crab fishing and a SBA identified for large gorgonian corals. The Eastern Avalon and Baccalieu Island EBSAs have been identified for the presence of seabird populations, cetaceans and leatherback turtles. Quidi Vidi Lake IBA is identified as bird habitat. Cape Spear and Signal Hill National Historic Sites are popular destinations for tourists and local people. Due to the short term and transient nature of vessel and aircraft traffic, and the existence of general marine traffic in eastern Newfoundland, cumulative effects from the Project in combination with other activities are not anticipated."

B. Response to IR-72/DFO-59 includes a new figure showing all licences, special areas and previous wells drilled within the Project RSA.

IR-224 DFO-106	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.1.3; Table 15.2, Table 15.3

Context/Rationale

Exploratory drilling in the Flemish Pass is stated to be 56 kilometres from CBdN and 88 kilometres from the PA. Information from the project description indicates that these activities may be within the PA and possibly the CBdN.

The section on exploratory drilling (Table 15.3) should include the number of wells drilled to date in the CBdN and in the PA as well as any currently proposed for those areas.

Request
15-Apr-19

A. In Section 15.1.3 of the EIS explain the overlap/distance of exploratory drilling to the CBdN and PA.

B. Include number of exploratory wells drilled and proposed in the CBdN and PA.

Equinor Response
15-Nov-19

A. Exploration wells are not included in the scope of the BdN Project but are included in the scope of existing Equinor environmental assessments for the Flemish Pass area (see Statoil 2017). Exploration drilling could be carried out on ELs within the BdN Project Area (i.e. EL 1143, EL 1154, EL 1156 held by Equinor Canada, which are scoped into existing and approved exploration drilling environmental assessments).

For clarity the Table 15.2 of the EIS will be amended to read as:

Table 15.2

Exploration Drilling Programs				
Husky Energy	Delineation / Exploration Drilling Program for Jeanne d'Arc Basin Area	115 km	178 km	2008 to 2020
Husky Energy	Husky Energy Exploration Drilling Project	131 km	203 km	2018 to 2025
Nexen	Flemish Pass Exploration Drilling Project	66 km	49 km	2018 to 2028
Equinor Canada	Flemish Pass Exploration Drilling Program	~~88 km~~intersect	~~56 km~~intersect	2018 to 2028

B. The number of exploratory wells previously drilled in the Project Area is provided in response to IR-220/Conformity DFO-5.

With regards to the number of exploration wells that could be drilled in the Project Area, a definitive answer cannot be provided. The decision to drill on an exploration

	licence is determined based on multiple considerations. As indicated in Section 1.3.2.1 of the EIS "ELs are issued for a term of nine years covering two periods. A well must be drilled or diligently pursed by the end of Period I in order to obtain tenure to Period II." Therefore, if the operator wishes to hold the licence for Period 2, then a well must be drilled. However, in some cases, no wells are drilled on exploration licences and the licence reverts to crown lands. If a discovery is made, as was the case with the Bay du Nord and Bay de Verde discoveries, multiple exploration and delineation wells could be drilled. Therefore, it is not feasible to provide a definitive number of wells that can be drilled per exploration licence.

IR-225 **DFO-107**	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.2
Context/Rationale	Section 15.2 of the EIS is insufficient in its characterization of cumulative effects for fish. Assessing cumulative effects using the Agency's guidance documents is a requirement of the EIS Guidelines. As examples in 12.2.4, only sound from seismic surveys are described for Geophysical and Other Exploration Activities. With respect to fishing activities, there is no discussion of what potential cumulative effects could be. For instance, if large pelagic species (e.g., swordfish) are avoiding multiple disturbances, there could be resultant cumulative effects. In 15.2.3, to provide a rating of residual effects there is no mention of mitigations with respect to drill cuttings and there is no discussion of the potential of seismic surveys to negatively interfere with commercial fishing or potential mitigation measures that could be employed to reduce this effect.	
Request **15-Apr-19**	A. Update Section 15.2 to provide a comprehensive review of cumulative effects on fish. B. Describe mitigations with respect to drill cuttings. C. Discuss the potential of seismic surveys to negatively interfere with commercial fishing and provide potential mitigation measures that could be employed to reduce this effect.	
Equinor Response **15-Nov-19**	A. As described in response to IR-219/Conformity DFO-4;CEAA, Equinor Canada is of the opinion that the cumulative effects assessment in Chapter 15 was carried out in accordance with the requirements of CEA Agency guidance and the EIS Guidelines. Section 15.2.2 provides an overview of Project-related contributions to cumulative effects and Section 15.2.3 provides a description of effects from other project and activities. This information, together with baseline conditions, is used to provide the cumulative effects assessment set out in Sections 15.2.4 through to 15.2.6 of the EIS. With respect to seismic sound, as per Section 3.2 of the EIS guidelines, sound emissions from geophysical activities are those "with the greatest effect' (EIS Guidelines 2018) and therefore was the focus of the cumulative effects assessment for sound emissions. The cumulative effects assessment is consistent with cumulative effects assessments undertaken in recently approved environmental assessments (e.g., Flemish Pass Drilling EIS (Statoil 2017). Updates to the EIS are not required. B. As stated in Section 15.1.5 of the EIS "The mitigation measures outlined in Chapters 9 to 14 are intended to avoid or reduce the potential effects and cumulative effects of the Project and are considered in the analysis of cumulative effects." Section 9.1.5.2 provides a list of mitigations for fish and fish habitat. See response to IR-101/Conformity DFO-1 regarding mitigations specific to project activities.	

	C. Effects of Project activities on Commercial Fisheries and Other Ocean Uses is provided for in Chapter 13. Potential effects of 4D seismic surveys undertaken during the Project is provided for in Section 13.2.5.1 of the EIS. Mitigations are listed in Section 13.1.5.2. See response to IR-101/Conformity DFO-1 regarding mitigations specific to Project activities. A discussion of cumulative effects of the Project, including other geophysical surveys (see Section 15.6.4), in combination with other Projects, on Commercial Fisheries and other Ocean Uses is provided for in Section 15.6. Updates to the EIS are not required.

IR-226 **DFO-110**	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.2.2; Section 15.5.4
Context/Rationale	The predicted zone of effects used throughout Section 15.2.2 of the EIS to assess cumulative effects is inconsistent. On page 15-18 (paragraph 2), the proponent states that the deposition of drill cuttings would be limited to within 200 m of the well site (also on page 15-61). This contradicts information provided in the assessment of potential effects of drill cuttings on fish and fish habitat (Page 9-42), which concludes that the PNET of 1.5 milimetre deposition may extend to 1 or 2 km depending on the particle size distribution and behavior used in the dispersal model. It also contradicts the conclusion of paragraph 3 (Page 15-19) that the zone of effects for exploratory drilling is mainly within one kilometre. The use of 200 metre minimizes potential cumulative effects. Similarly, the first paragraph of page 15-19 minimizes the potential for ecological or population level effects. The potential for direct cumulative effects on habitat by fragmentation, alteration or contamination should be considered.	
Request **15-Apr-19**	Update cumulative effects assessment to incorporate appropriate zones of influence and to describe ecological and population level effects.	
Equinor Response **15-Nov-19**	Equinor Canada disagrees with the reviewer's statement that "PNET of 1.5 millimetre deposition may extend to 1 or 2 km depending on the particle size distribution and behavior used in the dispersal model". As presented in Section 9.2.3.2 and as described in Appendix I, the base case with flocculation indicates that median deposition will be below the 1.5 mm and 6.5 mm predicted no effects thresholds (PNET) at less than 200 m from the modelled release site. The base case with flocculation is based on sediment characteristics sampled in the area and therefore, is likely reflective of the behaviour of drill cuttings discharge for the Bay du Nord Project. Drill cuttings deposited beyond 200 m are patchy in nature with median and maximum cuttings thickness below the 1.5 mm PNET. Drill cuttings that form piles around the drill site are largely water-based mud drill cuttings that are released near the seabed during the riserless phase of drilling. Water based muds are non-toxic in nature, however there are adverse effects associated with burial and creation of anoxic environments that are localized to the cuttings pile (refer to Section 9.2.3.2 of the EIS). Synthetic based mud is used after the riser is installed. SBM drill cuttings are treated according to Offshore Waste Treatment Guidelines (OWTG; NEB et al. 2010) before being discharged near the surface. SBM drill cuttings become highly dispersed in the deep-water environment and are not likely to form any aggregations above the PNET. The lack of SBM cuttings aggregations in addition to SBM fluids being of low acute toxicity and readily biodegradable (refer to Section 9.2.3.2 of the EIS) supports the conclusion that there would be limited cumulative effects associated with SBM discharge. In an assessment of the Jeanne d'Arc Basin on the Grand Banks, sediment toxicity stemming from the use of synthetic based drilling fluids by the Hibernia Platform and Terra Nova FPSO was confined a range of tens of meters from any cuttings pile in the immediate area of the facilities. Studies from other regions indicate that the effects of drill	

	cuttings discharge (SBM and WBM) are largely localized within 1-2 km of the drilling operation depending on the deposition characteristics, depth of water, and local currents (Section 9.2.3.2 of the EIS). In a study on the effects of SBM cuttings in the Gulf of Mexico, 14 drill sites on the continental shelf (40-300 m) and the continental slope (>300 m) were assessed. The indicated that areas of highest synthetic based fluid were observed within 250 m from the drill center and corresponded with reduced faunal abundance and diversity (Neff et al. 2005). However, these amphipod survival in toxicity tests with this sediment were greater than 75 percent, indicating that the sediment was not toxic (Neff et al. 2005). Reference stations in the far-field (3,000 to 6,000 m away) had a few stations with detectable synthetic based fluids. Total petroleum hydrocarbons (TPH), the toxic component of synthetic based fluid, were mainly similar to background concentrations (Neff et al. 2005). In this study, the cuttings solids distribution was patchy and decreased with distance from the drill center (Neff et al. 2005). As the effects are localized to the cuttings pile or tens of meters from the pile and the cuttings modelling indicates that cuttings thickness is below the PNET within 200 m, it is unlikely there will be overlapping effects from drill cuttings discharges with the Project or other oil and gas exploratory drilling activities. As indicated in Section 9.2.3.2 of the EIS, “should an 8-slot well template be drilled anywhere within the Core BdN Development Area, cuttings deposition would likely remain within the boundaries of the Project Area and there is little or no potential for these environmental releases from individual wells or multiple wells to interact or accumulate beyond the Project Area”. Drill cuttings deposited further away will be highly dispersed and unlikely to form large piles. Therefore, potential effects at distances greater than 200 m associated with toxicity, smothering, or creation of anoxic environments, would be unlikely. Modelling results are based on a worst-case scenario where drill cuttings are discharged from an eight well template. Drill cuttings discharged at any one time will likely be lower during operations. The information in the EIS as summarized here supports the low potential for ecological or population level effects as the effects are highly localized. Mitigations, such as the use of a CTS for water-based drill cuttings disposal and placement of templates in areas without *Lophelia pertusa* (see response to IR-101/Conformity DFO-3), will reduce potential effects on habitat fragmentation. While it was indicated at the Regulatory Review Workshop (May 2019) that the EIS would be amended to provide clarity, based on further review of the information in the EIS, Equinor Canada is of the opinion that the EIS provides sufficient information.

IR-227	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 15.2.2
DFO-112		
Context/Rationale	In Section 15.2.2, while the statement *“the installation of subsea infrastructure would add colonizing substrate to a habitat limited area”* is true, natural habitat will be altered and there will also be species that could be affected.	
Request **15-Apr-19**	Update Section 15.2.2 to discuss the potential negative effects associated with a change in habitat.	
Equinor Response **15-Nov-19**	For clarification, the text in 15.2.2 of the EIS will be amended to read as: “~~While~~ There would be short-term disturbance to fish habitats during construction and installation, and hook-up and commissioning (HUC) activities, ***that would potentially result in the injury or mortality of marine fish and invertebrates within the footprint of the subsea infrastructure. There may also be short-term and localized suspended natural sediments associated with placement of structures***	

	on fine mud substrates the installation of subsea infrastructure would add colonizing substrate to a habitat limited area. However, as described in Section 9.2.2.1, addition of subsea infrastructure over the life of the Project would likely increase habitat complexity supporting sessile invertebrates (e.g., hard structures for colonization) and mobile invertebrate and fish species (e.g., shelter, food subsidies).”

IR-228 **CEAA-96**	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.2.3
Context/Rationale	Section 15.2.3 of the EIS states that the environmental zone of influence of each project and activity in the region is typically localized and not likely to have an overall ecological or population level effect. However, the Project 4D seismic surveys are not localized by definition in the EIS (immediate vicinity of the source). Other operator 2D, 3D and 4D seismic surveys are also not localized as evident by data and information provided in Appendix L. Appendix L provides the soundscape contributions from seismic surveys and drill rigs. It is reasonable to consider that future seismic surveys will occur near the project areas over a 12 to 20 year period. Cumulative underwater ensonification is not addressed in the EIS. Therefore, spatial overlap of underwater sound emissions between projects was not mapped to validate the conclusion of localized effects. Cumulative effects within the Project for simultaneous operation were not assessed. For example, spatial overlap of drill cuttings from exploration drilling and the proposed production fields within the Core BdN Development Area and Project area were not considered for assessment of cumulative effects. Table 15.5 of the EIS provided some EEM results, but not full zones of influence of all discharges (effects of physical habitat, reef presence, change in flora or fauna presence / absence, change in food availability) and emissions (lights, sound). Monitoring of these parameters would substantiate the effects analysis.	
Request **15-Apr-19**	In Section 15.2.3 of the EIS provide a cumulative effects analysis and mapping of spatial overlap in the Project areas of drill wastes from the proposed production fields and exploration drill cuttings; discharges, lights and underwater sound from all relevant projects and within the proposed project, considering worse case scenarios.	
Equinor Response **15-Nov-19**	Equinor Canada does not agree with the statement of the reviewer that “Cumulative effects within the Project for simultaneous operations were not assessed.” See response to IR-219 (Conformity DFO-4) regarding the assessment of intra-project effects. As required under Section 19(1) of CEAA 2012 and Part 2, Section 7.6.3 of the Guidelines Equinor has assessed and evaluated any cumulative environmental effects that are likely to result from the Project in combination with other physical activities that have been or will be carried out in the region, as well as the significance of these potential effects. Past and on-going projects and activities and their environmental effects are reflected in the existing (baseline) environmental conditions for each valued component (VC) (refer to EIS Chapters 6 and 7). The Project-specific effects assessment considered how these existing environmental conditions may be affected by the Project, taking into account the interaction of various Project activities upon individual VCs. Cumulative effects assessment (CEA) considered whether and how the actual or predicted effects of other on-going and reasonably foreseeable future projects and activities would affect the same VCs through direct overlap in space and time and/or by affecting the same individuals or populations. The assessment also included consideration of mitigation measures to avoid	

	or reduce potential environmental (including cumulative) effects and evaluated the significance of predicted cumulative effects on each VC. Consistent with Agency guidance documents, the following other projects and activities were considered in the CEA for each VC, as relevant: • Hibernia Oilfield; • Terra Nova Oilfield; • White Rose Oilfield and Extension Project; • Hebron Oilfield; • Offshore Petroleum Exploration – Drilling; • Offshore Petroleum Exploration - Geophysical and Other Exploration Activities; • Fishing Activity; • Other Marine Vessel Traffic; and • Hunting Activity. As noted by the reviewer, a key consideration in assessing the potential for - and the nature and characteristics of - any cumulative effects resulting from the Project in combination with these other projects and activities relates to the spatial and temporal distributions of these and their associated environmental disturbances. This includes, in particular, the potential for the environmental zone of influence of the Project to overlap or otherwise interact with those of one or more of these other projects and activities. Where information was available on the overall spatial and temporal characteristics of these other projects and activities, this was presented and considered in the CEA (see for example EIS Table 15.2). Any further, available information on the known and likely effects of these projects and activities (and especially, their spatial and temporal characteristics) was also presented in the VC-specific sections and tables in Chapter 15 (see for example Table 15.4, which summarizes the result of environmental effects monitoring (EEM) programs completed for the various production projects, as relevant to the CEA for fish and fish habitat). Spatial overlap of drill cuttings is considered (see response to IR-226/DFO-110). For future activities, Equinor Canada would have to have knowledge of the planned locations of exploration wells from other operators; would need to know the exact location of commercial fishing activity, and the exact location/transit for seismic programs in order to provide the level of detail requested. Equinor has incorporated available information on future activities but has not incorporated any speculative information. The level of information provided in the EIS is consistent with standard EA methodology for other industries and international jurisdictions, and the information provided in recently approved environment assessments for offshore oil and gas projects. Updates to the EIS are not required.

IR-229	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.2.4
CEAA-97		
Context/Rationale	Section 15.2.3 of the EIS states that the environmental zone of influence of each project and activity in the region is typically localized and not likely to have an overall ecological or population level effect. However, the Project 4D seismic surveys are not localized by definition in the EIS (immediate vicinity of the source). Other operator 2D, 3D and 4D seismic surveys are also not localized as evident by data and information provided in Appendix L. Appendix L provides the soundscape contributions from seismic surveys and drill rigs. It is reasonable to consider that future seismic surveys will occur near the project areas over a 12 to 20-year period. Cumulative underwater ensonification is not addressed in the EIS. Therefore, spatial overlap of underwater sound emissions between projects	

	was not mapped to validate the conclusion of localized effects. Cumulative effects within the Project for simultaneous operation were not assessed. For example, spatial overlap of drill cuttings from exploration drilling and the proposed production fields within the Core BdN Development Area and Project area were not considered for assessment of cumulative effects. Table 15.5 of the EIS provided some EEM results, but not full zones of influence of all discharges (effects of physical habitat, reef presence, change in flora or fauna presence / absence, change in food availability) and emissions (lights, sound). Monitoring of these parameters would substantiate the effects analysis.
Request 15-Apr-19	In Section 15.2.4 of the EIS discuss the direct and indirect effects of changing habitat use by pelagic fish for four weeks from a seismic survey in a radius of 50 km.
Equinor Response 15-Nov-19	The text in Section 15.2.4 – Geophysical and Other Exploration Activities of the EIS will be amended to read as: "Due to the wide extent of geophysical survey activities, they have potential for overlapping and cumulative effects with Project activities. Geophysical surveys within the Project Area, particularly 3D/4D seismic surveys, will likely cause behavioural effects on fishes with swim bladders used in hearing, as well as species with sensitivities to particle displacement in the water column. ***Based on the sound modelling conducted (see Appendix D), available scientific literature, and the selection of 160 dB re 1 μPa (0-p) as the received SPL threshold for behavioural effects of fishes, behavioural effects on fishes could extend as far as 50 km from the seismic air source array. The 50 km distance would only apply to certain pelagic fish species that use their swim bladders to detect underwater sound and are highly sensitive to sound pressure. Since there is considerable variability in hearing sensitivity both within and between fish species, there would likely be different reactions from fishes occurring within 50 km of the seismic source. Although there could be distributional shifts in fish species due to exposure to sound from seismic activities, the overall behavioural effects would be temporary. All fishes would not leave the area defined by the 50 km radius***."

IR-230	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.4.4.2
DFO-111		
Context/Rationale	In Section 15.4.4.2 of the EIS, justification for the statement "It is also unlikely that short-term and localized effects experienced by a marine mammal at Jeanne d'Arc production fields would lead to additive cumulative effects for that individual that may move to the Project Area." is unclear.	
Request 15-Apr-19	In Section 15.4.4.2, provide rationale for the concluding statement "It is also unlikely that short-term and localized effects experienced by a marine mammal at Jeanne d'Arc production fields would lead to additive cumulative effects for that individual that may move to the Project Area" Explain how animals that are displaced from one area and face equal effects in another area, could not result in cumulative impacts.	
Equinor Response 15-Nov-19	Based on available literature and indeed marine mammals sightings in Jeanne d'Arc Basin, any displacement from production platforms is likely to be quite localized (see Sections 11.2.2.1 and 11.2.3.1 of the EIS). Marine mammals are not expected to vacate	

	the entire basin or Grand Banks and then move to Equinor Canada's Project Area. If an individual whale does exhibit localized avoidance of Jeanne d'Arc production facilities and then later travels the 118 km to 166 km to the Equinor Project Area, any avoidance effects are not expected to be additive. Localized avoidance of production fields will not limit the availability of known breeding, foraging, and nursing areas for marine mammals. For clarity the following text will be added to Section 15.4.4.2: "It is also unlikely that short-term and localized effects experienced by a marine mammal at Jeanne d'Arc production fields would lead to additive cumulative effects for that individual that may move to the Project Area. ***As discussed in Section 11.2.2.1 and 11.2.3.1, any displacement from production platforms (and drilling installations) is likely to be localized.*** Sea turtles are considered uncommon in Jeanne d'Arc Basin and rare in the Project Area."

IR-231	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.4.4
DFO-155		
Context/Rationale	In Section 15.5.4 of the EIS, it is not clear why there is focus on the Project Area (e.g., Table 15.12 of the EIS), given that the LSA "represents predicted zone of influence of the Project's planned components and activities" (Page 12-2). Potential cumulative effects from simultaneous/ multiple exploration programs should be described in Section 15 of the EIS (Page 15-63, paragraph 3).	
Request **15-Apr-19**	In Section 15.5.4 of the EIS, ensure cumulative effects assessment takes into account the LSA for Special Areas. Describe potential cumulative effects from exploration programs.	
Equinor Response **15-Nov-19**	See response to IR-223/DFO-154.	

IR-232	**Guideline Ref:** Part 2, Section 7.6.3	**EIS Ref:** Section 15.6.3
CEAA-99		
Context/Rationale	Table 15.4 in Section 15.6.3 of the EIS, notes that standard communications and coordination procedures between offshore oil and gas industry and fishers / fisheries managers helps to limit or eliminate the potential for adverse temporal / spatial interactions. Schedules and locations of science research surveys on the High Seas were not described in the EIS.	
Request **15-Apr-19**	Provide communication strategy for mitigation measures to avoid conflict with and foreign surveys and commercial fishing vessels in the High Seas areas.	
Equinor Response **15-Nov-19**	Mitigation measures regarding communication for Commercial Fisheries and Other Ocean Uses are listed in Section 13.1.5.1, and include the following mitigations • Ongoing communication with commercial fishers through One Ocean, Fish, Food and Allied Workers Union (FFAW-Unifor) and seafood producers regarding planned Project activities, including notification of coordinates of safety and/or anti-collision zones. • Ongoing communications with the NAFO Secretariat, through Fisheries and Oceans Canada (DFO) as the Canadian representative, regarding planned	

	Project activities, including timely communication of the anti-collision and/or safety zones • Ongoing communication with regulatory agencies to share information regarding the timing and location of activities (e.g., DFO research surveys, Department of National Defence (DND) offshore military exercises) • Equinor Canada will implement a standard marine communication protocol to promote safe practices between commercial fishing enterprises, other marine users and BdN operations. The protocol will be in accordance with the One Ocean Protocols for Communication with Oil Installations on the Grand Banks (n.d.(b)), which outlines communication requirements upon approach to the safety zone. • Issuance of Notices to Shipping and Notices to Mariners (where appropriate) regarding planned Project activities. These ongoing communications, as stated in Section 15.6.4 will reduce interference with other ongoing activities. While mitigations listed in each of the VC chapters were not repeated in Chapter 15, they were included in the overall cumulative effects assessment. For clarity, the sentence in Section 15.1.5 will be amended to read as: "The mitigation measures outlined in ***Chapters 9 to 14*** are intended to avoid or reduce the potential effects and cumulative effects of the Project ***and are considered in the analysis of cumulative effects***."

IR-233 **DFO-113**	**Guideline Ref:** Part 2, Section 7	**EIS Ref:** Section 16.0
Context/Rationale	Because the Environmental Protection and Compliance Monitoring Plan (EPCMP) for Equinor Canada was not made available for review, it is unclear whether more detail with respect to mitigation measures is presented within this document (more detail than Section 9.1.5.2).	
Request **15-Apr-19**	Describe the content of the Environmental Protection and Compliance Monitoring Plan with respect to mitigation measures.	
Equinor Response **2-May-19**	Equinor Canada responded to this IR in May 2019. The following information was provided: *The EPCMP (or EPP) is described in Section 2.10. The EPP is a requirement of the OA and will be submitted to the C-NLOPB during the OA application process. As described in Section 2.10.5, the mitigation measures provided for in the EIS will be integrated into the EPP.*	
DFO Response **10-Jun-19**	Response is adequate	

IR-234 **DFO-114**	**Guideline Ref:** Section 7.6.1	**EIS Ref:** Section 16.1.2.1, Table 16.1
Context/Rationale	In Section 16.1.2.1 of the EIS, information on dispersants and Corexit is lacking.	
Request **15-Apr-19**	A. In Section 16.1.2 of the EIS, describe the proposed aerial and subsea dispersants to be used and the associated potential for toxicity to marine organisms. B. Describe toxicity profiles for Corexit (EC9500A and EC9580A).	
Equinor Response **2-May-19**	Equinor Canada responded to this IR in May 2019. The following information was provided: *Corexit EC9500A and EC9580A are prescribed in regulation "List of Spill-treating Agents (Canada Oil and Gas Operations Act) (SOR/2016-108) as the only two spill-treating agents approved for use in Canada. The legislative process to prescribe these agents would have considered their toxicity profiles. In particular, the following is a statement in the Gazette regarding toxicity assessment of these chemical treating agents "The scientific testing conducted by the Department of the Environment to identify the STAs listed in the proposed Regulations focused on assessing toxicity and effectiveness…The Department of the Environment has evaluated the acute lethality of the STAs listed in the proposed Regulations on several aquatic test species, including vertebrates and invertebrates. It has also tested sublethal effects to fertilization on echinoids and microbial growth inhibition." (http://www.gazette.gc.ca/rp-pr/p2/2016/2016-06-15/html/sor-dors108-eng.html)* *Table 16.1 provides information on Corexit EC9500A. Information on the environmental effects of dispersants is provided in Sections 16.7.4.4; 16.7.5.4, 16.7.6.5, and 16.7.8.2.*	
DFO Response **10-Jun-19**	The additional details provided by Equinor on the dispersants and their associated potential toxicity should be included in the EIS.	
Equinor Response **15-Nov-19**	As stated in Table 16.1 of the EIS, there are two spill-treating agents approved for use in Canada. As stated in our 2-May-19 response, the approval process for these spill-treating agents considered their toxicity. The EIS Guidelines provide the following guidance regarding dispersants: "If dispersants are to be used, the proponent shall provide a plan for their use and consider associated environmental effects in the EIS (e.g. effects on marine life and other resource users)." As stated in our 2-May-19 response, information on the environmental effects of dispersants is provided in Sections 16.7.4.4; 16.7.5.4, 16.7.6.5, and 16.7.8.2 of the EIS. It is Equinor Canada's opinion that the requirement of the EIS Guidelines have been met. Updates to the EIS are not required.	

IR-235 **NRCan-12**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.1.2.1
Context/Rationale	Section 16.1.2.1 of the EIS notes that the application of dispersants can be a useful tool during spill response to mitigate potential effects of a spill. The descriptions for their use suggest that the proponent will use dispersants according to their assessment of need. Currently, there are rules for the potential use of dispersants in Canadian waters. In particular, the Canada Oil and Gas Operations Act outlines specific conditions for gaining approval for its use.	

Request **15-Apr-19**	Provide an expanded description for the use of dispersants to include the steps that are required to obtain approval for their use.
Equinor Response **15-Nov-19**	Information regarding obtaining approval for dispersant use is included in the EIS. Section 16.1.2.3, Table 16.1 states the following: *"Authorization required from C-NLOPB before application," "Only two spill treating agents* (Corexit® EC9500A and Corexit® EC9580A) have received regulatory approval for use in Canada (the intended use of Corexit® EC9580A is to treat substrate)". Furthermore Section 2.2 of Appendix O states "Equinor Canada will not use dispersants without prior regulatory approval. If dispersant use is advisable in the event of a spill (as informed by a SIMA process), Equinor Canada will seek approval from the C-NLOPB Chief Conservation Officer, in accordance with the Accord Acts. With the amendments made to the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* through the implementation of the Energy Safety and Security Act, the C-NLOPB will be able to conditionally approve the use of one or more of the spill treating agent products listed in the *Regulations Establishing a List of Spill-treating Agents* (*Canada Oil and Gas Operations Act*) to respond to an oil spill. Corexit® 9500A, the primary spill treating agent used during the Deepwater Horizon incident spill response effort, along with Corexit® EC9580A, are currently the only spill treating agents approved for use in Canada. The intended use for Corexit® EC9580A is to treat substrates.*"* Pursuant to section 138.21 of the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act*, SC 1987 c. 3, the C-NLOPB may permit the use of a spill-treating agent in an authorization issued under paragraph 138(1)(b) if the Board determines that the use of the spill-treating agent is likely to achieve a net environmental benefit. However, Equinor understands, that prior to using an approved spill-treating agent in response to a spill, it must first seek the approval of the Chief Conservation Officer (*Canada-Newfoundland and Labrador Atlantic Accord Implementation Act*, s. 161.1). Equinor will take all necessary steps prior to using a spill-treating agent in the event of a spill. For clarity, the following amendments will be made to Table 16.1: • "Only two spill treating agents (Corexit® EC9500A and Corexit® EC9580A) have received regulatory approval for use in Canada (the intended use of Corexit® EC9580A is to treat substrate) ***((Canada Oil and Gas Operations Act) (SOR/2016-108))"*** • "Dispersants***, as approved,*** can be applied at surface (aerially or from vessels) or through subsea dispersant injection (SSDI); requires mobilization of specialized equipment and dispersants"

IR-236 **NRCan-13**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.1.2.3, Table 16.1
Context/Rationale	The comments made in Section 16.1.2.3 of the EIS suggest that environmental effects of an oil spill are only the result of surface oil. Oil that is dispersed into the water column is described as being "naturally metabolized" suggesting that it is completely removed from the water environment by biodegradation and that there are no toxic effects during this process.	

Request 15-Apr-19	Explain why crude oils and marine diesel are described as persistent and describe the potential effects that persistent components of the oil could have on the marine ecosystem.
Equinor Response 15-Nov-19	Table 16.1 is a listing of possible spill response options in the event of a spill, with information to highlight activities involved per option and the environmental considerations for each option. It is not intended to provide an overall assessment of the effects of a hydrocarbon spill. The effects of a hydrocarbon spill are provided for in Section 16.7. The text "droplets are naturally metabolized by micro-organisms" is provided to explain what natural attenuation / degradation means. It is not meant to imply that one type of hydrocarbon is more / less persistent than another. For clarification regarding the persistence of hydrocarbons see response to IR-243/NRCan-14. While it was indicated at the Regulatory Review Workshop (May 2019) that the EIS would be amended to provide clarity regarding hydrocarbon persistence, based on further review of the information presented in the EIS, and as described above, Equinor Canada is of the opinion that updates to the EIS are not required.

IR-237 **C-NLOPB-7**	**Guideline Ref:** Part 2, Section 7.3, Section 7.6, Section 7.6.1	**EIS Ref:** Section 16.2
Context/Rationale	In Section 16.2 of the EIS, vessel collisions are discussed as a spill potential; however, the potential impact of sea ice or icebergs are not mentioned as a potential impact.	
Request 15-Apr-19	Discuss the accidental scenario possibilities of impact with sea ice and icebergs and assess the potential effects of these type of accidents as well as what mitigation measures would be put in place should this type of accident occur.	
Equinor Response 15-Nov-19	The potential accidental scenario of impact with sea ice and icebergs is included in Section 16.2.1 and Section 17.3.3. Section 16.2.1 provides a cross-reference to Chapter 17 and states "Accidental events associated with local conditions and natural hazards such as extreme weather conditions and external events (e.g., seismic events, icebergs, hurricane, submarine landslide potential) are addressed in Chapter 17". For clarity the text in Section 16.2.1 of the EIS will be amended to read as: "Accidental events associated with local conditions and natural hazards such as extreme weather conditions and external events (e.g., seismic events, icebergs, hurricane, submarine landslide potential) are addressed in ***Section 17.3.3***." Section 17.3.3 of the EIS describes the potential effects of sea ice and icebergs, and associated mitigation measures.	

IR-238 **DFO-115**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.3
Context/Rationale	Section 16.3 of the EIS states "The results of the analyses show that the probability of a well blowout is extremely low, with the probability increasing for batch spills. The analyses also show that if a blowout or batch spill was to occur, the chances are great that it would be a small volume of spillage rather than a very large event with high consequences." is highly subjective.	

Request 15-Apr-19	Quantify the volume amounts in the statement "The results of the analyses show that the probability of a well blowout is extremely low, with the probability increasing for batch spills. The analyses also show that if a blowout or batch spill was to occur, the chances are great that it would be a small volume of spillage rather than a very large event with high consequences."
Equinor Response 15-Nov-19	Section 16.3 of the EIS includes a detailed analysis and discussion related to spill risk and probabilities. The text in Section 16.3 is an introduction to spill risk and probabilities. The statement quoted by the reviewer in the specific question / information requirement is not intended to be quantitative, rather its purpose is a summary statement that reflects the analyses completed throughout Section 16.3. For clarity, the text in Section 16.3 of the EIS will be amended to read as: "The following section addresses the first two aspects; the third aspect is addressed in Sections 16.7 and 16.8. ***This section reviews the available data and findings based on historical research of offshore spills to determine the probabilities for spills and the potential spill volumes that might be involved.*** ~~The results of the analyses show that the probability of a well blowout is extremely low, with the probability increasing for batch spills. The analyses also show that if a blowout or batch spill were to occur, the chances are great that it would be a small volume of spillage rather than a very large event with high consequences." This section reviews the available data and findings based on historical research of offshore spills to determine the probabilities for spills and the potential spill volumes that might be involved"~~

IR-239 **C-NLOPB-8**	**Guideline Ref:** Part 2, Section 7.3, Section 7.6, Section 7.6.1	**EIS Ref:** Section 16.3.4; Tables 16.8 and 16.9
Context/Rationale	In Section 16.3.4 of the EIS, for this project, with 40 wells and a 20-year life, Table 16.8 predicates the probability of a blowout is 0.16 or there is a 16% chance of a blowout occurring over the life of the project. This seems to be high.	
Request 15-Apr-19	Explain how a 0.16 probability of a blowout (i.e. 16% chance of occurring over the project life) was calculated.	
Equinor Response 15-Nov-19	For spill probabilities, standard and accepted practice is to review historical data of varying accidental events, both international and local, to determine the probability of that event occurring. As stated in Section 16.3 of the EIS: "[t]he probability of various kinds of potential spill releases and well blowouts and their respective volumes were analyzed with the application of a fault tree analysis that included Monte Carlo simulations. This methodology allows for incorporation of uncertainty in fault tree estimate inputs, as well as the incorporation of distributions of probabilities of various outcomes. There are three important aspects to determining the "spill risk" associated with offshore development activities: • Determining the likelihood or probability that a well blowout or other well release will occur • Determining the potential oil spillage volumes that might occur and the probabilities that the spill will be a large-scale spill."	

For the blowout scenario, the probability analysis methodology employed is described in Section 16.3.3 of the EIS. Note that the methodology employed for blowouts was based on development wells only; it did not include blowout statistics for exploration wells. In addition, the probability analyses included the probability for a subsurface blowout of the volumes used in the BdN Project spill trajectory analysis (i.e., a total volume released of 378,000 m^3 for Site 1 and 1,207,500 m^3 for Site 2).

Tables 16.8 and 16.9 provide historical spill probabilities for blowouts based on the total number of wells that could be drilled per the scope of the Project. However, the data presented in these table are misleading for development wells in that it assumes that the probability remains constant as the well is drilled and subsequently produced. It assumes that the Project will drill all 60 wells and that all wells will be in production for the life of the Project (30 years). This is not a realistic scenario and overestimates the probability of a blowout. It assumes that all wells are producing wells and does not account for injection wells. Whereas for BdN approximately half of the wells drilled will be production wells. Probability analysis does not account for the depletion of hydrocarbons in the reservoir as the well is produced, therefore the amount of hydrocarbon available to be released decreases overtime. Furthermore, if there was Future Development phase, these wells would be drilled later in the Project life. Overall, development wells are drilled and phased in over time and not present for 20 years (Core BdN Development; 30-year for Future Development). Therefore, to assume that for the Core BdN Development a total 40 wells will be in production for 20 years with hydrocarbons present is inaccurate. The probabilities cannot be multiplied by total number of wells and life of field. Blowout spill probabilities for ‘well-year’ must account the life of the well in production, and depleting reservoir volumes. Hence, the probabilities as presented in Tables 16.8 and 16.9 of the EIS are overestimated.

The probabilities of spills per volume category (i.e., moderate, large, very large and extremely large) identified in Tables 16.8 and 16.9 are based on historical spill data. It is important to note that the probability for the ‘moderate’ volume category is the historical probability for this size of spill or larger (i.e., it also includes the probabilities for the larger volume sizes). Therefore, conservatively, the probability of a blowout at Site 1 where water depths are approximately 1,100 m, for any volume of spilled oil from a blowout would be 1.7×10^{-4}. For water depths of approximately 500 m (Site 2) the probability for any volume of spilled oil from a blowout would be 2.4×10^{-4}. Spill probabilities for the modelled subsurface blowout scenarios were also provided to place the probability for the Project in the context of historical data.

Based on the above discussion, to avoid confusion and provide clarity in the EIS, and to align with the presentation of spill probability data in previous environmental assessments for development projects offshore NL (e.g. Hebron Project EIS (ExxonMobil 2011) and in the United Kingdom (Chevron 2018), Section 16.3.4 of the EIS will be modified to read as:

16.3.4 Probabilities of Blowouts from the Project

“Analyses of international and national historical spill data verify that large blowouts can be considered relatively rare events. The estimated probability that a specific individual development well from the proposed Project would have a blowout varies by location, with the difference being attributable to water depth. The probabilities of spills per volume category (i.e., moderate, large, very large and extremely large) identified in Tables 16.8 and 16.9 are based on historical spill data. It is important to note that, for instance, the probability for the ‘moderate’ volume category (i.e., 1.7×10^{-4} for Site 1 and 2.4×10^{-4}) are the historical probability for this size of spill or larger (i.e., it includes the probabilities for the larger volume sizes) in different water depths. Therefore, conservatively, the historic probability of a blowout of any volume size, in approximately 1,100 m water depth, would be 1.7×10^{-4} and 2.4×10^{-4} for water depths of 500 m. Spill probabilities for the modelled subsurface blowout scenarios are also provided in the context of historical data. For the BdN Project, the probability of a blowout occurring for the volume of the modelled worst-case blowout scenarios is between 1.7×10^{-9} to 3.4×10^{-9}, or between a 1 in 207,000,000 to 1 in 414,000,000 chance of occurring, depending on water depth and total volume released. The calculated probabilities for subsurface blowouts by volume category for Sites 1 and 2 are summarized in Table 16.8 and Table 16.9.

Table 16.8 Probabilities of Project Well Blowouts by Volume Category: Site 1

Historical Blowout Probabilities		
Volume Category (Total volume released)	**Historical Frequency**	**Approximate Return Period**
Moderate 10–100 bbl / 1.59–15.9 m^3	1.7×10^{-4}	6000
Large 1,000–10,000 bbl / 159–1,590 m^3	1.5×10^{-4}	6,700
Very Large 10,000–150,000 bbl / 1,590–23,848 m^3	1.3×10^{-4}	7,500
Extremely Large >150,000 bbl / >23,848 m^3	8.3×10^{-5}	12,000
Project Blowout Modelled Scenarios		
Volume Category (Total volume released)	**Estimated Frequency**	**Approximate Return Period**
Scenario Site 1-36 2,377,548 bbl / 378,000 m^3	3.4×10^{-9}	300,000,000
Scenario Site 1-115 7,594,947 bbl / 1,207,500 m^3	1.7×10^{-9}	414,000,000

Table 16.9 Probabilities of Project Well Blowouts by Volume Category: Site 2

Historical Blowout Probabilities		
Volume Category (Total volume released)	**Historical Frequency**	**Approximate Return Period**
Moderate 10–100 bbl / 1.59–15.9 m^3	2.4×10^{-4}	4,100
Large 1,000–10,000 bbl / 159–1,590 m^3	2.2×10^{-4}	4,600
Very Large 10,000–150,000 bbl / 1,590–23,848 m^3	1.9×10^{-4}	5,200
Extremely Large >150,000 bbl / >23,848 m^3	1.2×10^{-4}	8,600
Project Blowout Modelled Scenarios		

Volume Category (Total volume released)	Estimated Frequency	Approximate Return Period
Scenario Site 1-36 2,377,548 bbl / 378,000 m^3	4.8 x 10^{-9}	207,000,000
Scenario Site 1-115 7,594,947 bbl / 1,207,500 m^3	2.4 x 10^{-9}	414,000,000

Upon review of Section 16.3.7 in light of the comments and questions provided clarification is required. Section 16.3.7 will be amended to read as:

Section 16.3.7

"In the EIS Guidelines, the Proponent is required to indicate how the Project may affect the overall probability of spill occurrences in the Flemish Pass area. Other potential sources of spills outside the Project include vessels (e.g. fishing vessels, survey vessels) and exploration drilling programs. In general terms, the overall spill probability in an area increases as the number of wells (i.e. the activity level) increases. The probability analysis presented above for the BdN Project, provide probabilities on a 'per well' basis such that the probabilities can readily be extrapolated based on the number of wells.

Table 16.16, which is adapted from Equinor Canada's Drilling EIS (Statoil 2017) provides probability of blowouts and batch spills for exploration drilling for various release volume categories.

Equinor Canada is the operator of the majority of the exploration licenses in the Flemish Pass. Table 16.17 provides the cumulative estimated probabilities of spills during exploration drilling and development drilling (see Table 16.13). It is conservative as it assumes that the probabilities are additive. As probability assessments consider spills at varying water depths and volumes, Table 16.17 includes the more conservative probability for a small volume released from a blowout and not the modelled scenarios, as described in Section 16.3.4.

Table 3.1 Flemish Pass EIS – Probabilities of Batch Spillage by Volume

Volume Category	Probability (Frequency in Exploration Period)	
	35-Day Exploration Duration/Well	65-Day Exploration Duration/Well
Small (< 1 bbl; <159 litres)	0.037	0.069
Small/Moderate (1-10 bbl; 159-1,590 litres)	0.0046	0.0085
Moderate/Large (100-1,000 bbl; 15.9-159 m^3)	0.0023	0.0044
Subsurface Blowout	1 x 10^{-4}	
Source Statoil 2017		

Table 3.2 Estimated Cumulative Spill Probability for Production and Exploration

Volume Category	BdN Project Development Drilling Probabilities of Spills (per well)	Exploration Drilling Probabilities of Spills (per well)	Cumulative Spill Probability* (per well)

Batch Spill			
Small <1 bbl / <0.159 m^3	0.077	0.069	0.15
Small/Moderate 1–10 bbl / 0.159-1.59 m^3	0.011	0.0085	0.020
Moderate/Large 100–1,000 bbl / 15.9–159 m^3	0.0073	0.0044	0.012
Subsurface Blowouts			
BdN Site 1	1.7×10^{-4}	1×10^{-4}	2.7×10^{-4}
BdN Site 2	2.4×10^{-4}		3.4 x 10-4
* numbers rounded to nearest significant figure			

The cumulative probabilities noted are based on a per-well basis. This is not a realistic scenario and overestimates the probability of a blowout. It assumes that all wells are producing wells and does not account for injection wells. Whereas for BdN approximately half of the wells drilled will be production wells. Probability analysis does not account for the depletion of hydrocarbons in the reservoir as the well is produced, therefore the amount of hydrocarbon available to be released decreases overtime. Furthermore, if there was Future Development phase, these wells would be drilled later in the Project life. Overall, development wells are drilled and phased in over time and not present for life of Project (20 years for Core BdN Development; 30 years for Future Development). Therefore, to assume that for the Core BdN Development a total 40 wells will be in production for 20 years with hydrocarbons present is inaccurate."

IR-240 **DFO-116**	**Guideline Ref:** Part 2, Section 7.6.1; Section 7.5	**EIS Ref:** Section 16.3.5.1; Table 16.13; Section 16.7, Section 16.7.3.1; Section 16.7.4.6, Section 16.7.4.8
Context/Rationale	The statement "*The probability of a blowout occurring in the volume of the modelled blowout scenarios is between 1.7 x 10-9 to 3.4 x 10-9*" (Page 16-31) is not clear in representing the case for the project because it refers to one specific scenario in the hypothetical situation where a single well was drilled. This would mean roughly one chance in two billion. The way this statistic is derived is likely incorrect, because such accidents have already occurred throughout history. Consequently, the only number reported is that of the "impossible". What would be more relevant to the project is that given the number of wells projected (10 to 40, see Page 16-24) and the duration of the project (12-30 years, see Page 16-24), the probability of a "large spill" range between 2% and 28% and the probability of a "very large spill" between 2% and 25%. We can also push the reflection further and affirm that if 40 wells are drilled in 30 years, the probability of an "Extremely large spill" is 16%. All these numbers are reported in Table 16.8 for Site 1. These statistics are much more relevant than those presented. 'Relatively rare' in "A review of the history of FPSO spills indicates that these incidents are relatively rare. [...] For spills less than 1,000 bbl (158 m³) (for which no international data exists)" (Page 16-34) is subjective and should be removed if no international data exists for anything smaller than 1000 bbl. 1000 bbl (158m³) is a large spill (largest in NL history is about 250m³). Information on smaller spills should be provided.	

	Table 16.13 indicates that the probability of a moderate to large spill is 0.0073/well/year. In this case, counting 40 wells over 30 years operation (maximum projected operation size and time) means that we should expect about nine spills to occur between 100 to 1000 bbl. If one extends the results from Table 16.10 to the probability of a 100 bbl spill (0.013 or 0.025 per year depending on the production rate because these statistics seem linear with the size), we obtain a spill probability between 39% and 75% if the project lasts 30 years, which does not appear to be rare. The word “unlikely” in “….potential environmental effects that may occur in the unlikely event that an accident” (Page 16-124), is subjective (unless quantified) . The term “extremely unlikely” in “The extremely unlikely and unmitigated subsurface blowouts at Sites 1 and 2” [...] in these extremely low probability cases, the total hydrocarbon concentration [...]” (Page 16-128) and “An extremely unlikely subsurface blowout […]” (Page 16-142) appears to not align based on the discussion above, the probability of an “extremely large spill” is 16%. The wording “extremely unlikely” and “very unlikely” needs to be substantiated by data.
Request 15-Apr-19	A. Update the probability of a blowout. B. Update the definition of the probability of a spill less than 1000 bbl. C. Describe probability of a smaller spill (100 bbl). D. Update the definition of the probability of other batch spills. E. Ensure appropriate description of likelihood in Chapter 16, and remainder of EIS.
Equinor Response 15-Nov-19	A. See response to IR-239/C-NLOPB-8 B. The probability assessment for spills from an FPSO is accurate. The methodology for the probability assessment is provided in section 16.3.3 and is a standard and accepted approach to determine spill probabilities. The statement “A review of the history of FPSO spills indicates that these incidents are relatively rare” is a valid statement. It is supported by statistics presented in the EIS. Section 16.3.5.1 states “The largest spill occurred in the late 1990s when the Texaco Captain spilled 3,900 bbl (620 m^3) due to human error. According to a study conducted for the US in 2001 (Minerals Management Service 2001), there have been 206 FPSO spills totaling 4,641 bbl up to that point, which included the 3,900-bbl Texaco Captain spill.” To support the spill probability analysis for spills from an FPSO presented in Section 16.3.5.1, the source of the data used is provide clarity for the readers. Unlike the SINTEF database for historical well blowouts and releases, there is not a similar database for FPSO spills. International jurisdictions vary in their reporting requirements for small spills and therefore there is no international data for small spills from FPSOs. In the NL offshore, the C-NLOPB requires the reporting of all spills, and therefore, the C-NLOPB spill statistic database was used to provide spill data for these small spills. The probability assessment, as stated in the EIS, uses available international data for the ‘very large spills’ and C-NLOPB data for spills less than 159 m^3 from FPSOs, which is the only dataset available. For clarity, the text in Section 16.3.5.1 of the EIS will be amended to read as: “***Based on historical data for FPSO spills, the data indicates that large spills from an*** FPSO are relatively rare. The largest ***FPSO*** spill occurred in the late

	1990s when the Texaco Captain spilled 3,900 bbl (620 m^3) due to human error. According to a study conducted for the US in 2001 (Minerals Management Service 2001), there have been 206 FPSO spills totaling 4,641 bbl up to that point, which included the 3,900-bbl Texaco Captain spill. It is important to note that the number of historical spills from FPSOs is quite limited and therefore these probabilities are based on a relatively small data set. ***Unlike the SINTEF database for historical well blowouts and releases, there is not a similar database for FPSO spills.*** Very large FPSO spill rates were based on **available** international data as this category of spill has not occurred under the C-NLOPB jurisdiction. For spills less than 1,000 bbl (159 m^3) (for which no international data exists), the probability estimates provided in Section 16.3.5.2 are based on C-NLOPB data. The estimated FPSO spill rates are provided in Table 16.10, which are based on the estimated production rates for the Project. These are used to develop the probabilities of spills from FPSOs by volume category (Table 16.11)." C. The probabilities of smaller spills, ranging from >0.159 m³ to 159 m³, is presented in Section 16.3.5.1. D. The term "extremely unlikely" applies to the probability estimate for the worst-case subsurface scenarios modelled in the EIS, upon which the accidental events effects assessment is based. For the BdN Project, the probability of a blowout occurring for the volume of the modelled worst-case blowout scenarios is between 1.7 x 10^{-9} and 3.4 x 10^{-9}, which are extremely unlikely events. Hence the use of the term "extremely unlikely" in Chapter 16 in describing the modelled worst-case scenarios is appropriate. The statement in Section 16.7 of the EIS "This section provides an assessment of the potential environmental effects that may occur in the unlikely event that an accident event such as subsurface blowout or a batch / instantaneous spill occurs during the life of the Project" will be modified to read as: "This section provides an assessment of the potential environmental effects that may occur, such as an ***extremely unlikely*** subsurface blowout or a batch / instantaneous spill." E. The spill probability assessment provided in Section 16.3 is valid. Additional updates to the EIS are not required.

IR-241	**Guideline Ref:** Section 7.6.1	**EIS Ref:** Section 16.3.7
DFO-117		
Context/Rationale	In Section 16.3.7 of the EIS the derivation of the cumulative probability calculation for small/moderate batch spills of 97% (Table 16.17) is unclear. Even acknowledging the caveats indicated in Section 16.3.7, page 16.39 that support the statement that this figure is likely overestimated, such high probability indicates that at the very least, batch spills should not be considered an unexpected event, but a regular unplanned event associated with planned operations. Cordes et al (2016) (cited in Chapter 16), which provides a detailed review of environmental impacts of offshore oil and gas aimed at providing guidance for management strategies for the industry, makes this very point by stating "While all of these examples represent accidental discharges, the frequency at which they occur in offshore waters suggests that they can be expected during "typical" operations". Assuming these spills will not happen as part of regular operations is misleading; these "unplanned but regularly occurring" events should be presented as part of regular operations, and integrated into the analyses of Chapter 9.0.	

Request **15-Apr-19**	Incorporate batch spills into Chapter 9.0, or justify inclusion in Chapter 16.0.
Equinor Response **2-May-19**	Equinor Canada responded to this IR in May 2019. The following information was provided: *A spill, including batch spills, is defined under the Accord Acts as an unauthorized discharge. Chapter 9 assesses effects of operational activities (discharges and interactions), whereas Chapter 16 assesses the effects of spills, or unauthorized discharges, including batch spills.*
DFO Response **10-Jun-19**	Response is adequate

IR-242 **DFO-118**	**Guideline Ref:** Section 7.3.8.3; Section 7.6.1	**EIS Ref:** Section 16.3.7
Context/Rationale	Regarding modelling of the different spill modelling exercises detailed in Section 16 (e.g., synthetic-based mud has limited consideration of local oceanography and seascape), indicated that, to a greater or lesser degree, the most significant exposures would be expected along the Flemish Pass to the south of the two sites modelled, and on the Flemish Cap proper. These areas contain significant and extensive coral and sponge habitats (i.e., Significant Benthic Areas (SBAs) and current Vulnerable Marine Ecosystems (VMEs) which would be exposed to the most severe impacts associated with spills. Since the SBA and current VME habitats have been omitted from the EIS, there is no assessment of environmental effects at the spatial scale of these habitats. The conclusion of the EIS with respect to these important components is incomplete.	
Request **15-Apr-19**	Update the effects assessment to include potential effects to Significant Benthic Areas (SBAs) and Vulnerable Marine Ecosystems (VME) habitats.	
Equinor Response **15-Nov-19**	As stated in Section 16.4.1 of the EIS “Site 1 was chosen as the site for a potential subsurface blowout and batch spills within the Core BdN Development Area as it is located within a Special Area (see Section 6.4).” Furthermore, as stated in Section 16.7.7.3, the “assessment is conservative as it assumes there will be a temporal and spatial overlap between a spill and a special area.” The spill modelling location is within the Northwest Flemish Cap (10) NAFO FCA, which is noted for its concentration of seapens and sponges. The effects assessment for accidental events, therefore, inherently considers effects on benthic habitats in special areas. Descriptive information on updated VMEs was requested from DFO in May 2019, from NAFO in July 2019 but not yet been received as of September 12, 2019. Currently available information (See IR-191/DFO-54) will be presented in Section 6.4.2 and included in Section 16.7.7 (see IR-203/DFO-25). SBA shape files have been obtained from DFO. Various reports on SBA modelling have been received. Descriptions of SBAs were requested from DFO in June 2019 and as of September 12, 2019 no additional information has been received (See IR-191/DFO-54). As stated above, Section 16.7.7 will be updated to include information that is now available (see IR-203/DFO-25). The text in Section 16.7.7.3 – Special Areas Identified for Biological VCs will be amended to read as follows. The updated Table 16.40 can be found in Appendix H to this Response Document. **Subsurface Blowout**	

	"Modelling results for unmitigated subsurface blowouts predict surface oiling on waters that intersect with Special Areas within the Flemish Pass, Flemish Cap, Orphan Basin, southern Grand Banks and associated slope waters and large areas where hydrocarbons at the surface are predicted to exceed the conservative ecological threshold thickness. In the selected 95th percentile scenario for surface oil exposure releases, surface oil was predicted to be thickest closest to the release location…Based on modelling, surface oil was predicted to exceed the ecological threshold in special areas identified for the presence of marine and migratory birds (Table 16.40). These include Canadian EBSAs (i.e., Notre Dame Channel, Fogo Shelf, Southeast Shoal, Eastern Avalon, Southwest Slope, Baccalieu Island, ***Virgin Rocks, Lilly Canyon-Carson Canyon, Bonavista Bay***), ~~PRMAs (i.e., Virgin Rocks, South Grand Banks Area)~~, Witless Bay Seabird Ecological Reserve, ***UNCBD EBSAs (***Seabird Foraging Area in the Southern Labrador Sea***, Southeast Shoal and Adjacent Areas on the Tail of the Grand Bank*** ~~UNCBD EBSA~~, and IBAs (i.e., Witless Bay Islands, Mistaken Point~~, The Cape Pine and St. Shotts Barren~~, Quidi Vidi Lake, Wadham Islands and Adjacent Marine Area***, Cape Freels Coastline and Cabot Island***). While any oil on the surface, as predicted by spill modelling, will not reach Quidi Vidi Lake itself, oil could intersect with a portion of the Quidi Vidi Lake IBA, which includes coastal areas… Modelling also predicted that surface oil in exceedance of the ecological threshold could reach special areas identified for the presence of marine mammals and sea turtles (Table 16.40). These include EBSAs (i.e., Notre Dame Channel, Fogo Shelf, Northeast Slope, Lilly Canyon-Carson Canyon, Southeast Shoal, Eastern Avalon, Southwest Slope, Laurentian Channel***, St. Mary's Bay, Bonavista Bay, Baccalieu Island***), and ***Southeast Shoal and Adjacent Areas on the Tail of the Grand Bank UNCBD EBSA*** ~~South Grand Bank Area PRMA, and Southeast Shoal and Adjacent Shelf Edge / Canyons VME~~. The 95th percentile scenario for in-water exposure indicate that areas reaching or exceeding the ecological threshold, which could change water quality and therefore could affect fish habitat availability and quality in special areas such as Lily Canyon-Carson Canyon EBSA, Slopes of the Flemish Cap and Grand Bank UNCBD EBSA and VMEs ~~(Northern Flemish Cap, Southern Flemish Pass to Eastern Canyons, Beothuk Knoll, Flemish Cap East)~~. For these areas identified as important features for fish species, marine mammals and sea turtles, effects from a subsurface blowout were assessed in Section 16.7.4 and 19.7.6 concluded that residual effects on these species would not be significant. The 95th percentile deterministic modelling for shoreline contact predicted less than 0.1 percent of the total oil released making contact with areas of the Avalon Peninsula and isolated areas of the Burin Peninsula…Given the time to shore and with the application of mitigation and response measures, the magnitude and extent of effects would be reduced. The modelling predicted ***the coastline of the Avalon Peninsula*** ~~the Northwestern Conception Bay PRMA, which is identified as a capelin spawning area~~, could potentially be affected by shoreline contact above ecological threshold. While shoreline oil has the potential to interact with coastal ~~spawning~~ areas, the oil would be highly weathered (i.e. lighter ends would have evaporated, dissolved, and degraded thereby reducing the toxicity of the residual oil)… The modelling ~~indicates~~ ***predicted*** a very low potential for oil exceeding ecological threshold to reach special areas on the coast of NL, which have been identified for the presence of marine and migratory birds. The special areas include Canadian EBSAs (i.e., Eastern Avalon, Placentia Bay, St. Mary's Bay, Baccalieu Island), Provincial ecological reserves (i.e., Witless Bay, Baccalieu Island, Mistaken Point and Cape St.

Mary's) and IBAs (i.e., Witless Bay Islands, Cape St. Francis, Baccalieu Island, Grate's Point, Mistaken Point, The Cape Pine and St. Shotts Barren, Placentia Bay, Cape St. Mary's) ***and VMEs for Sea Pens and Large Gorgonian Corals***. As stated above, by the time oil made contact with the shoreline, it would be patchy, discontinuous and weathered…

Special areas in the Flemish Pass, Flemish Cap and Grand Banks, designated due to their unique or sensitive benthic habitat features ~~(i.e., corals and sponges),~~ could be at risk of exposure to oil in sediment resulting from a subsurface blowout. The modelling location at Site 1 was chosen due to the presence of Northwest Flemish Cap (10) NAFO FCA, which is designated due to the presence of high concentrations of sea pens and sponges~~. While the spilled oil itself is not predicted to interact with sediments, interactions with benthic fish habitat are possible due to flocculation and oil sinking with plankton and microbial pathways. However, the~~ ***The*** modelling predicted that less than 0.01 percent of the oil would adhere to sediment and estimated concentrations were low (less than 0.01 g/m²). This is well below the ecological threshold of 100 g/m². With the application of mitigation and spill response options, the magnitude and extent of the effects would likely be reduced. As concluded in Section 16.7.4, residual effects on ***sensitive benthic habitat features*** ~~***Special Areas***~~ were predicted to be not significant."

Batch spills and vessel collision

"Special Areas overlapping with areas exceeding unmitigated oil concentration thresholds for surface oil, water column or sediment include the Slopes of the Flemish Pass and Grand Bank UNCBD EBSA, Northwest Flemish Pass (10) NAFO FCA and ~~the Sackville Spur VME~~. These areas are identified and/or protected for sensitive benthic habitat (Table 16.40)…

For the spill of marine diesel from a vessel to vessel collision nearshore, the release would likely result in a rainbow sheen (0.0001 to 0.001 mm) for approximately 40 km before transitioning to the colourless and silver sheen (less than 0.0001 mm)…The Eastern Avalon is identified as a feeding area for seabirds, cetaceans and leatherback turtles. ~~Though the EBSA description is not available for~~ Baccalieu Island ***has been identified for aggregations of killer whales, capelin, shrimp, plankpiscivores, spotted wolffish as well as seabirds*** ~~it is likely due to the presence of seabird breeding colonies based on descriptions of this area as an Ecological Reserve and an IBA~~.

In-water concentrations of THC are predicted to be highest in the immediate vicinity of the release."

SBM Whole Mud Spill

"The results of modelling suggest that if SBM were to be released at these sites, there is the potential for measurable seabed deposition to extend 1.5 km from the spill site. In addition, there is potential for water column concentrations to exceed 10,000 mg/L within 10 m of spill locations. The following special areas are located within the relevant area of measurable seabed deposition and water column concentrations exceeding the identified threshold.

- UNCBD EBSA: Slopes of the Flemish Cap and Grand Bank
- NAFO FCAs: Sackville Spur (6), Northwest Flemish Cap (10)
- VMEs: ***Sponge and Sea Pen*** ~~Sackville Spur~~"

These special areas have all been identified and/or protected due to the presence of high densities or corals and/or sponges. The effects of an SBM spill on Fish and Fish Habitat

	was assessed in Section 16.7.4, and it was predicted that residual effects on the benthic community would be not significant. Since the modelling for the SBM spill used a location within the NAFO FCA Northwest Flemish Cap (10), the conclusions reached for fish and fish habitat equally apply here.

IR-243 **NRCan-14**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.4.1.1, Table 16.21
Context/Rationale	In Table 16.21 of Section 6.4.1.1 of the EIS, for the "In Water Concentration" row, the whole oil is referred to as equivalent to the "THC" of the oil. Total hydrocarbon content is the content of a prepared subfraction of the oil that contains no heteroatoms such as sulphur and nitrogen, and being that it is measured using a gas chromatography technique, consists of hydrocarbons that are only up to 40 carbons in size. Consequently, it does not include the resin and asphaltenes fractions of the crude, nor any of its vacuum residue fraction. These non-measured components of crude oils make the oil "persistent". The proponent should use publically available crude oil assay data that is suitable, (i.e. for instance https://corporate.exxonmobil.com/-/media/global/files/crude-oils/terra-nova/crude_oil_terra_nova_assay.pdf)	
Request **15-Apr-19**	Describe the portions of the crude that are likely to persist.	
Equinor Response **15-Nov-19**	Equinor Canada received a similar IR from NRCan for the Drilling EIS (i.e. IR-49 and 51), and no follow-up IRs were issued, and therefore Equinor Canada is of the opinion that the response was deemed acceptable. Table 16.21 refers to thresholds used to define areas and volumes of the environment that may experience exposure above a threshold of concern. The table notes 1 ppb (µg/L) of dissolved PAH's (only the soluble fraction of the whole oil) is roughly equivalent to 100 ppb (µg/L) of whole oil (i.e. soluble fraction is about 1% of whole oil). Refer to Table 16.24 to define "persistent" fraction of oil, which is 37% (weight %) of the Bay du Nord crude oil. In the SIMAP model, this includes any crude oil component with a boiling point above 380°C, essentially composed of aromatics ≥4 rings and aliphatics >C_{20} that are neither volatile nor soluble and includes resins, asphaltenes, and other high molecular weight compounds. Oil is combination of hundreds of thousands of different chemicals that each have their own physical (e.g., density, viscosity, etc.) and chemical (e.g., volatility, solubility, etc.) properties and behaviors. Refer to EIS Appendix E, Table 3-2 identifying the 7-component pseudo-component breakdown of BdN crude and marine diesel used in the SIMAP model. The pseudo-component approach used in the modeling allows for the characterization of these different fractions of oil with different chemical and physical parameters and therefore different behavior within the environment when released. The lightest ends of oils (and least persistent) are broken out into Group 1 (AR1 and AL1), encompassing all compounds that have boiling points less than 180°C. AR1 includes soluble and volatile compounds, which include BTEX and MAHs (C_6-C_9), and AL1 includes insoluble and volatile compounds, which includes highly volatile aliphatics (C_4-C_8). Lighter ends (i.e., Group 1) evaporate, dissolve, and degrade more quickly than the more persistent Groups 2 and then 3. A fraction of most oils could be considered persistent (i.e., it lasts longer in the environment with low rates of weathering and degradation) and is characterized in this table as "residual" fraction (e.g., asphaltenes and resins). Within the SIMAP model, these residual compounds are persistent as they do not evaporate or dissolve and only degrade at very slow rates over time. Of note, 100% of the oil is characterized by the sum of the	

	pseudo component groups (i.e. AR1+AR2+AR3+AL1+AL2+AL3+residual). 37% of BdN and 2.7% of marine diesel is classified as residual (boiling point above 380°C). It is important to note that a single oil is characterized by numerous lab studies including numerous assays, distillation, GCMS, and many other chemical and physical measurements of the oil. Due to each chemical analysis only measuring a handful of the compounds within each oil, the results from numerous studies are combined to characterize the 7-components discussed above in the pseudo-component breakdown. Many of these measurements are publicly available; however, some data are not and are considered proprietary, such as the oil property information provided by Equinor Canada used in the modelling. Sources of chemical and physical data that are used regularly include the Environment and Climate Change Canada ETC Oil Database (http://www.etc-cte.ec.gc.ca/databases/oilproperties/), CrudeMonitor.ca (https://crudemonitor.ca/). While it was indicated at the Regulatory Review Workshop (May 2019) that the EIS would be amended to provide clarity in the EIS, based on further review of the information in the EIS, Equinor Canada is of the opinion that updates to the EIS are not required.

IR-244 **C-NLOPB-9**	**Guideline Ref:** Part 2, Section 7.3, Section 7.6, Section 7.6.1	**EIS Ref:** Section 16.4.1.1
Context/Rationale	In Section 16.4.1.1 of the EIS, Equinor states, “Stochastic results are useful in planning for oil spill response, as they characterize the probability that regions may experience contamination above specified thresholds, taking into account the wind and wave variability that is expected from many potentially-different release scenarios over time.” The modeling for the purposes of the EIS is to predicate effects not to plan a spill response.	
Request **15-Apr-19**	Explain in Section 16.4.1.1 of the EIS how the output is used to predict effects from the model.	
Equinor Response **15-Nov-19**	The text in Section 16.4.1.1 of the EIS will be amended to read as: “Stochastic results are ***also*** useful in planning for oil spill response, as they characterize the probability that regions may experience contamination above specified thresholds, taking into account the wind and wave variability that is expected from many potentially-different release scenarios over time.”	

IR-245 **NRCan-15**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.4.2; Table 16.23
Context/Rationale	Table 16.23 of Section 16.4.2 of the EIS gives densities and viscosities of Marine diesel. However, in NRCan’s view, the numbers require clarification as they do not make sense based on the temperatures given. For the density, it is shown to decrease at the lower temperature when the opposite is true all the time i.e. as found with the BdN crude values. Density increases as temperature decreases. As well, it is not expected that the viscosity for the diesel will be the same at both temperatures.	
Request **15-Apr-19**	Clarify the values given for densities and viscosities of marine diesel.	
Equinor Response **15-Nov-19**	Table 16.23 will be amended as follows:	

Table 16.23 Physical Properties for the Two Oil Products Used in Modelling

Physical Property	BdN Crude Oil	Marine Diesel
Density (g/cm^3)	0.84553 @16°C 0.85800 @0°C	0.83100 @15~~25~~°C 0.83089 @16°C
Viscosity (cP)	5.0 @20°C 53.0 @0°C	2.76 @15~~25~~°C 2.76 @15°C

IR-246 **C-NLOPB-10** **C-NLOPB-11** **C-NLOPB-12**	**Guideline Ref:** Part 2, Section 7.3, Section 7.6, Section 7.6.1	**EIS Ref:** Section 16.4.3.1
Context/Rationale	In Section 16.4.3.1 of the EIS, for the release scenarios presented, thickness and dissolved concentration exceed the model domains in both probability of occurring and the days in excess of surface thickness and concentration. The model also limits the domain to which predication of shoreline contact to that of the island and Labrador. The model domain exceedances are not near the boundary in most cases and indicate that oil concentration that may result in an effect could be present outside of model domain. The extent of the oil on the surface, its concentration and the extent of shoreline oiling outside of the model domain needs to be defined to evaluate the impact of the spill scenario. Because thresholds limits are predicted to occur outside of the 160 day model domain it is not possible to ascertain when a threshold is reached, and therefore, the extent and possible effects of the oil. The proponent has not provided sufficient information to demonstrate the fate and effect of oil above thresholds outside of the model domain.	
Request **15-Apr-19**	A. Update the prediction of the extent of the oil on the surface, its concentration and the extent of shoreline oiling outside of the model domain and possible effects of that oiling. B. Provide a suitable explanation as to the volume of oil above threshold values that is outside of the model domain along with its fate, i.e. dispersed or reached shore, and its possible effects.	
Equinor Response **15-Nov-19**	It is the opinion of Equinor Canada that the modelling results presented in the EIS meet the requirements of the EIS Guidelines. Section 7.6.1 of the EIS Guidelines state "Results should be reported in a manner that illustrates the effects of varying weather and oceanographic conditions that may occur throughout the year, and should include a projection for spills originating at the site and followed until the slick volume is reduced to a negligible amount or until a shoreline is reached." As indicated by the modelling results, shorelines were reached in as little as 13-34 days, yet simulations were run for 160 days. The approach and modeling extent have been used in numerous environmental assessments, including the recently approved Flemish Pass Exploration Drilling Project (Statoil 2017) in the region. The amount of oil that was predicted to leave the model domain was not presented for each of the 171 or 172 simulations within each stochastic simulation. However, from the stochastic minimum time plots, it always took >25 and typically >50 days for oil to leave the domain. At that point, the oil would be highly weathered as patchy and discontinuous surface oil that would be in the form of an emulsified oil and/or tarballs (i.e., less toxic residual fraction) with very little in the way of toxic lighter ends. For the unmitigated representative deterministic 95th percentile "worst case" scenarios, between 5.6% and 22.92% of the total release volume (Table 4-4 of Appendix E) left the model domain (Figures 4-40, 4-45, 4-50, 4-55, 4-60, and 4-65 of Appendix E) over 160 days at levels	

	almost entirely of a dull brown sheen or thinner. Smaller amounts of entrained oil were also predicted to leave the model domain at concentrations less than 50 µg/L (Figures 4-42, 4-47, 4-52, 4-57, 4-62, and 4-67 of Appendix E) within the surface few meters (due to the see-sawing nature of surface oil and entrained oil that is a function of wind speed, wave height, and resulting entrainment of oil into the surface layer and resurfacing). For the response mitigated scenarios, between 10.70% and 15.32% of the total release volume (Table 4-5 of Appendix E) was predicted to leave the model domain as predominantly highly weathered surface oil (Figures 4-80 and 4-81 of Appendix E). For clarity the following text will be added to Chapter 16 of the EIS. <u>Section 16.7.3.1</u> ***"Modelling predicted that between 5.6 percent and 22.92 percent of the total release volume could leave the model domain. Based on stochastic modelling (with 171 or 172 individual trajectories throughout the year and over multiple years), it always took greater than 25 days, and typically greater than 50 days for oil to leave the model domain. At this time, the oil would be highly weathered (i.e., lighter ends would have evaporated, dissolved, and degraded) thereby reducing the toxicity of the residual oil. It would be present as patchy and discontinuous emulsified oil and tarballs. At the end of 160 days, oil outside the model domain would be dispersed to the point that average thicknesses over this area would be at a level of dull brown sheen or thinner."*** <u>Section 16.7.4.6, 16.7.5.6, Section 16.7.6.7, 16.7.7.3, 16.7.8.3</u> – Subsurface Blowout ***"For oil that was predicted to leave the model domain for an unmitigated spill, with minimum times greater than 25 days or typically greater than 50 days, should oil reach shorelines outside the model domain, it would be highly weathered (i.e., lighter ends would have evaporated, dissolved, and degraded) thereby reducing the toxicity of the residual oil. It would be present as patchy and discontinuous emulsified oil and tarballs. With the application of mitigation and response measures, it would further reduce potential for effects."*** <u>16.7.9.4 – Subsurface Blowout</u> ***"For oil that was predicted to leave the boundaries of the model for an unmitigated spill, with minimum times greater than 25 days or typically greater than 50 days, should oil reach shorelines outside the model boundaries, it would be highly weathered (i.e., lighter ends would have evaporated, dissolved, and degraded) thereby reducing the toxicity of the residual oil. It would be present as patchy and discontinuous emulsified oil and tarballs. With the application of mitigation and response measures, it would further reduce potential for effects."***

IR-247 **DFO-119**	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 16.7.4.3
Context/Rationale	Section 16.7.4.3 of the EIS, describes effects of oil exposure on two copepod species (Calanus glacialis and C. finmarchicus), reported as having different sensitivities to exposure. The ecological implications of this situation is overlooked in the EIS. However, C. finmarchicus is both the most sensitive to oil of the two, but is also of greater importance as a food source. Simply reporting that one species is more sensitive than another does not reflect the ecological context in which the finding must be interpreted. Annual variability in C. finmarchicus abundance has been shown in several research	

	studies to be correlated with substantial changes in survival and biomass of many fish species.
Request 15-Apr-19	Provide ecological context for the discussion of effects on copepods from accidental events.
Equinor Response 15-Nov-19	The importance of Calanus finmarchicus is described in the existing environment section on Zooplankton (Section 6.1.5.2 of the EIS). This section notes that "The largest and most abundant is a boreal species Calanus finmarchicus, an energy-rich keystone copepod species, which is ubiquitous throughout the North Atlantic from the Gulf of Maine to the Barents Sea". The potential effects of an hydrocarbons on plankton are discussed in Section 16.7.4.3 of the EIS. The effects of an unmitigated spill event on plankton (including zooplankton) have been considered. As noted in the EIS "The potential longer-term effects of plankton and microbe mortality due to exposure to hydrocarbons is twofold: (1) they are an important food source for higher trophic levels (e.g., fish and invertebrates), and (2) since most fish and invertebrate species have one or more life stages in a planktonic phase, there is potential effect on recruitment into the adult fish and invertebrate population." Updates to the EIS are not required.

IR-248 **CEAA-100**	**Guideline Ref:** Part 2, Section 7.3, Section 7.6, Section 7.6.1	**EIS Ref:** Section 16.7.4
Context/Rationale	In Section 16.7.4 of the EIS, the potential effects in measureable changes in habitat, food, fauna mortality, injury, health and presence or absence are not discussed clearly in each of those four effects categories to be able to adequately review the effects analysis conclusions.	
Request 15-Apr-19	Update effects analysis of potential measurable changes taking into account habitat, food, fauna mortality, injury, health, and distribution based on the effects rating categories.	
Equinor Response 15-Nov-19	The approach adopted by Equinor Canada in assessing the potential effects of accidental events upon each of the various VCs is consistent with the approach which has been applied by other offshore operators and which has been accepted by the CEA Agency. It is established that the methodology for the assessment of potential effects of accidental events differs from the assessment of effects associated with routine Project activities. For each VC discussed in Chapter 16, the assessment of accidental events considers the scenarios for which interactions are identified in Table 16.37, Table 16.38, Table 16.39, Table 16.41, Table 16.42 and Table 16.44 as appropriate. The identification of potential interactions and associated effects specific to each VC is appropriate in the case of routine Project activities (see for example, Table 11.5). In such a case, consistent with the Guidelines, assessment is based upon the activities which have the greatest potential to have environmental effects. Past experience, scientific literature and professional judgement demonstrate that for each VC and depending on the nature of the Project activity or phase, there are interactions which may either result in no discernable effects or in effects which can be managed to acceptable levels through the application of best practices or regulatory requirements (see Section 4.3.2). Thus, for example, in the case of Marine Mammals and Sea Turtles, it has been determined that there is no interaction between Project lighting and the presence, health or abundance of marine mammals. However, a different approach is appropriate for the assessment of the potential effects of accidental events. In identifying interactions between specific VCs and a potential	

	accidental event, an extremely conservative approach has been employed, based on a worst-case scenario without the application of mitigations, spill containment or response measures. While the assessment of accidental events relates to the same VC-specific effects descriptors as are used for the assessment of routine Project activities, the pathways for effects are different. In the case of accidental events, the range of circumstances in which accidental events may occur and their inherent unpredictability make it difficult, if not impossible, to characterize in advance the results of accidental events by reference to the particular effects descriptors applied to routine Project activities. Potential effects of accidental events will depend upon a variety of factors including the presence of the VC, the nature and magnitude of the spill, prevailing weather and sea conditions, spill trajectory, timing and seasonality. In addition, a consistent theme noted in Indigenous and stakeholder engagement has been a concern over the potential consequences of accidental events (see Chapter 3). This supports a holistic approach to assessment – that is, one which assumes that assessment of all potential interactions is warranted. Thus, for example, in the case of Marine Fish and Fish Habitat, Section 16.7.4.2 assumes, consistent with the overall conservative approach to the analysis of accidental events, that any of the identified accidental event scenarios have the potential to affect one of more of fish habitat, food availability, health, presence and abundance. A similar conclusion has been reached with respect to other relevant VCs. As part of the assessment methodology, environmental effects mechanisms are identified and discussed, including a review of available research and scientific data. Residual effects are characterized in summary tables and the significance of residual effects is determined using the same VC specific thresholds as are used for the determination of the significance of routine Project activities. The analysis of accidental events in Chapter 16 is consistent with the CEA Agency direction in Section 7.6.1 of the EIS Guidelines. It is also consistent with the analytical approach undertaken in the environmental assessment of other offshore projects (e.g., Flemish Pass Drilling EIS (Statoil 2017). The EIS is complete. Updates are not required.

IR-249 **DFO-120**	**Guideline Ref:** Part 2, Section 7.3.1, Section 7.6.1	**EIS Ref:** Section 16.7.4.3
Context/Rationale	Section 16.7.4.3 of the EIS does not address potential impacts to eelgrass ecosystems in the event of an oil spill reaching shore. Eelgrass is a documented ESS (Ecologically Significant Species; DFO 2009 & 2011 CSAS reports) and habitat dominated by this plant are the functional nursery areas for several coastal and offshore species of commercial and cultural significance. Yet, there is no mention of this habitat anywhere in the EIS.	
Request **15-Apr-19**	Discuss potential effects of an oil spill on eelgrass ecosystems.	
Equinor Response **15-Nov-19**	Section 16.7.4.6 – Subsurface Blowouts of the EIS notes that coastal nursery habitats may be affected by a hydrocarbon exposure. In the extremely unlikely event of an unmitigated oil spill reaching a shoreline, it will be weathered patchy and discontinuous; given this and the application of mitigation and response measures, it is unlikely that the overall abundance, distribution, or health of affected coastal areas would be significantly affected. For clarity, the following text will be included in Section 16.7.4.3 - Plants and Macroalgae of the EIS.	

	"The response of macroalgae ***and seagrass*** species to oil spills is variable and dependent on the degree and length of exposure. ***Potential effects on seagrasses may include incorporation of sub-lethal quantities that reduce tolerance to other stress factors and smothering by stranded oil resulting in mortality. Based on exposure studies of eelgrass to the Exxon Valdez oil spill, oil primarily affected flowering (Dean et al. 1998 in Ralph et al. 2007). The effects on flowering are suggested to not likely to affect well established meadows as seagrasses have other ways of propagation (Dean et al. 1998 in Ralph et al. 2007). One year after the Exxon Valdez oil spill Dean et al. (1998 in Ralph et al. 2007) indicated that there were no differences among oiled and reference eelgrass sites and that there was no overall impact on seagrass biomass, density, flowering or seed production. Seagrasses at deeper waters are considered to be able to recovery better than smothered intertidal seagrasses (Ralph et al. 2007)"*** The proposed amendments do not change the conclusions of the EIS. References: Ralph, P. J., Tomasko, D., Moore, K., Seddon, S., & Macinnis-Ng, C. M. (2007). Human impacts on seagrasses: eutrophication, sedimentation, and contamination. In *Seagrasses: Biology, Ecology and Conservation* (pp. 567-593). Springer, Dordrecht.

IR-250 **DFO-121**	**Guideline Ref:** Part 2, Section 7.3.1	**EIS Ref:** Section 16.7.4.3
Context/Rationale	Using guidance provided by Food and Agricultural Organization of the United Nations (FAO) in relation to fishing impacts on VMEs, the timeframe for considering an impact temporary is that recovery to the pre-impact state should be within 5 to 20 years (paragraph 19, FAO 2009); it follows that recovery times longer than 20 years should be deemed permanent. In Section 16.7.4.3 of the EIS, under the subheading "Deep-Sea Corals and Sponges" page 16-138 references a modelling study by Girard et al 2018 and states "The model predicted that the majority of corals that were impacted would be fully recovered within a decade with the more heavily impacted corals taking up to three decades to reach a state where all remaining branches appear healthy (Girard et al. 2018)". Considering the timeframes for temporary impacts from FAO (2009), this would suggest that most impacts could be considered temporary, while only the most severe ones would be deemed permanent. However, in Girard et al. (2018), bullet #4 in the abstract states "Overall, our model overestimates recovery, but branch loss estimates were reliable. Thus, the available growth rate data suggest that hundreds of years may be necessary for impacted communities to grow back to their initial biomass". This indicates that the damage should be deemed permanent.	
Request **15-Apr-19**	A. Revisit the concluding statements of effect ratings and reversibility definition in Table 4.5 in light of the information in Girard et al. (2018). B. Provide any updates as necessary or justification of the use of the rating provided.	
Equinor Response **15-Nov-19**	Reversibility, as defined in Section 4.3.3 of the EIS, is consistent with the definition of reversibility used in environmental assessments recently approved by the CEA Agency (e.g., Flemish Pass Drilling EIS (Statoil 2017); Eastern Newfoundland Offshore Exploration Drilling Project (ExxonMobil 2017)). As defined in the BdN EIS, a reversible effect will eventually recover to baseline conditions.	

	Toxicity and exposure effects to benthic habitat, including corals, from accidental events are described in Section 16.7.4.3 of the EIS and reference various studies from the Deepwater Horizon Spill (e.g., Hsing et al. 2013; Montagna et al. 2013; Fisher et al. 2014). Girard et al. (2018) conducted modelling for recovery of three deep-water coral communities that were affected by the Deepwater horizon oil spill in the Gulf of Mexico. The modelling included projections on branch states (e.g., visibly healthy, unhealthy, hydroid-colonized) and estimates of branch loss primarily on the branched coral *Paramuricea biscaya*. This study indicated that corals impacted by the Deepwater Horizon spill "could take up to three decades before the remaining branches visibly recover, and that visible recovery of individual colonies is dependent on their initial level of impact. However, the bulk of the recovery is expected on timescales on the order of a decade." (Girard et al. 2018). Although, there would be a recovery of individuals to a healthy state, the model estimated a 3-14 percent reduction in biomass with branch loss. Girard et al. (2018) suggested that for the slow growth rates for this *P. biscaya* (i.e., life spans of over 600 years, radial growth between 0.34-14.20 um/year and linear growth rates of 0.019 cm/year to >1 cm/year [Prouty et al. 2017]) that a return to full biomass would likely take hundreds of years. As predicted by the BdN spill trajectory modelling results (Appendix E of the EIS), estimated concentrations of hydrocarbons on the sediment would be low (less than 0.01 g/m^2, below the ecological threshold). With the low predicted interaction of an <u>unmitigated</u> oil spill with benthic environments and organisms including corals, it is concluded that corals exposed to hydrocarbons would eventually recover to baseline conditions. In studies from the Deepwater Horizon spill, the recovery of corals is dependent on the initial level of impact (e.g., Girard et al., 2018; Girard and Fisher 2018). There were interactions of factors specific to the Deepwater Horizon spill that may have influenced direction of hydrocarbon to benthic habitats including interaction of released oil with sediments, drilling muds, and other materials used in response efforts such as the "topkill" and "junk shot". Oil spill science, including fate and behaviour of oil and interactions of sediments and dispersants, are currently areas of active research. Additionally, there continues to be active research associated with the Deepwater Horizon spill, including the mass balance of the oil spilled and impacts from response efforts on the release. EIS predictions remain valid. Updates to the EIS are not required. References: Fisher, C.R., P.-Y. Hsing, C.L. Kaiser, D.R. Yoerger, H.H. Roberts, W.W. Shedd, and J.M. Brooks. 2014. Footprint of Deepwater Horizon blowout impact to deep-water coral communities. Proceedings of the National Academy of Sciences, 111(32): 11744-11749. Hsing, P.Y., B. Fu, E.A. Larcom, S.P. Berlet, T.M. Shank, A.F. Govindarajan, A.J. Lukasiewicz, P.M. Dixon, and C.R. Fisher. 2013. Evidence of lasting impact of the Deepwater Horizon oil spill on a deep Gulf of Mexico coral community. Elementa: Science of the Anthropocene, 1:12. Girard, F., and C.R. Fisher. 2018. Long-term impact of the Deepwater Horizon oil spill on deep-sea corals detected after seven years of monitoring. Biological Conservation, 225, 117-127. Girard, F., Shea, K., and Fisher. 2018. Projecting the recovery of a long-lived deep-sea coral species after the Deepwater Horizon oil spill using state-structured models. Journal of Applied Ecology, 55(4), 1812-1822.

	Montagna, P.A., J.G. Baguley, C. Cooksey, I. Hartwell, L.J. Hyde, J.L. Hyland, R.D. Kalke, L.M. Kracker, M. Reuscher, and A.C.E. Rhodes. 2013. Deep-sea benthic footprint of the Deepwater Horizon blowout. PLoS ONE, 8: e70540.

IR-251 **CEAA-101**	**Guideline Ref:** Part 2, Section 7.3, Section 7.6, Section 7.6.1	**EIS Ref:** Section 16.7.4.3
Context/Rationale	Section 16.4.3.2 of the EIS notes that corals and sponges are considered ecosystem engineers that provide critical habitat to other taxa and because of their life history they are susceptible to accidental events. This information is not considered in Section 6 or Section 9 of the EIS where critical habitat is stated as not being present in the Project Area.	
Request **15-Apr-19**	Update the effects analysis in the EIS to include information on the ecological importance and critical habitat of corals and sponges or provide rationale in Section 16.4.3.2 of the EIS for not including the description of the ecological importance and critical habitat of corals and sponges in Section 6 of the EIS, nor in the effects analysis and ratings in Section 9.	
Equinor Response **15-Nov-19**	See response provided in IR-65/ DFO-51, IR-67/DFO-52 and IR-69/DFO-55 regarding clarification on benthic habitats. The term 'critical habitat' is used in the EIS when discussing habitat that has been designated critical habitat under the Species at Risk Act (refer to response to IR-189/DFO-9). Contextual information regarding corals and sponges is provided in Section 6.1.7.6 of the EIS, including information on their ecological role (e.g., biogenic habitat, nursery areas, foraging areas). This information is inherently considered in the existing environment for Special Areas (e.g., Section 6.4.2, 6.4.4) that describes areas delineated for protecting coral and sponge resources. As sensitive sessile species, they have also been specifically discussed in relation to drill cuttings deposition (Section 9.2.3.2) and accidental events (Section 16.7.4.3). The level of information provided for describing the existing biological environment is consistent with the level of information that has been deemed acceptable by CEAA in the environmental assessment of other offshore oil and gas projects. Updates to the EIS are not required.	

IR-252 **CEAA-102**	**Guideline Ref:** Part 2, Section 7.3, Section 7.6, Section 7.6.1	**EIS Ref:** Section 16.7.4.5
Context/Rationale	In Section 16.7.4.5 of the EIS, potential health effects from chronic exposure to whole SBM related to lethal (mortality) toxicity tests but references are provided for health effects from SBM cuttings. Whole mud and mud infused cuttings are different materials. Change in fish health was not described in Section 9 of the EIS. An assessment on changes in ecosystem and valued component health is required in the EIS Guidelines.	
Request **15-Apr-19**	A. Update the EIS in Section 16 related to "chronic exposure to whole SBM" and the effects on fish health. B. Update the EIS in Section 9 related to "chronic exposure to SBM cuttings" and the effects on fish health.	

Equinor Response 15-Nov-19	A. As stated in Section 16.7.4.5, the chronic effects of accidentally released synthetic based fluid and SBM cuttings on the seafloor are primarily associated with the degradation of organic components and associated creation of anoxic environments. As stated in Section 9.2.3.2 of the EIS, Payne et al. (2006) found that substantial sediment toxicity stemming from the use of synthetic based drilling fluids in the Jeanne d'Arc Basin area on the Grand Banks should be confined to a range of tens of meters from any cuttings pile deposited on the seabed. Formation of SBM cuttings piles are not likely considering the water depths and discharge near the surface. However, similar effects with creation of anoxic environments would likely occur in areas with accidental discharge of synthetic based fluid (USDOI MMS 2004; CNSOPB 2005). Following degradation of hydrocarbon components, studies of various spills have indicated recovery within a few years (USDOI MMS 2004; CNSOPB 2005) (see Section 16.7.4.5 of the EIS). As discussed in the EIS, potential environmental effects for accidental release of synthetic based fluids and SBM cuttings deposition are considered low. The potential effects would be localized to the depositional area (see Section 9.2.3.2 of the EIS) and degradation of toxic components and associated recovery is estimated to occur within a few years. Effects of an SBM spill are considered low for mobile species due to potential avoidance of smothering and burial. There would mortality associated with sessile or low mobility invertebrate species within the footprint from smothering and anoxic environments. The EIS is complete. Updates are not required. B. The potential effects of whole SBM and SBM associated drill cuttings are described in Sections 9.2.3.2 and 16.7.4.5 of the EIS, including a discussion of the effects of synthetic based fluids. Drilling fluid toxicity is primarily attributed to hydrocarbon content (Neff et al. 2000 in Vincent-Akpu 2013). As indicated in these sections of the EIS synthetic based fluids have low toxicity and Pure Drill IA-35 is considered least hazardous in the Offshore Chemical Notification Scheme (OCNS). For example, as stated in Section 9.2.3.2 of the EIS "Lobsters exposed to high levels of SBM fluid in laboratory experiments, for example, did not change aspects of lipid and protein metabolism or have other adverse health effects after approximately 20 days (Hamoutene et al. 2004)." SBMs are readily biodegradable with predicted partial recovery of the area within weeks to months and full recovery within a few years (See response provided in IR-253/CEAA-103). Laboratory studies of SBM fluid on marine sediments indicated that total petroleum hydrocarbon (TPH) levels degraded by approximately 31 percent and 14 percent in fresh and recycled synthetic-based fluids respectively after incubation at 5°C for four weeks (COOGER and Lee 2009). While degradation at seafloor temperatures would likely be slower, bacteria adapted to the cold-water environments may facilitate hydrocarbon degradation of in synthetic-based fluids (COOGER and Lee 2009). Some laboratory studies have investigated the potential for chronic effects on fish, as indicated in Section 9.2.3.2 "Toxicity experiments with fish indicated that acute toxicity of SBMs was generally low (96-h LC50 toxicity of greater than 30,000 mg/L, Jagwani et al. 2011), but there were potential health effects with chronic exposure to SBM associated cuttings (Jagwani et al. 2011; Gagnon and Bakthyar 2013; Vincent-Akpu 2013)." Gagnon and Bakhtyar (2013) investigated the effects of ester-based, isomerized olefin-based and linear alpha olefin-based drilling fluids on juvenile pink snapper under laboratory conditions. Exposure to these synthetic-based fluids resulted in EROD induction, accumulation of biliary metabolites and increase in stress proteins which are biomarkers for exposure to contaminants (Gagnon and Bakhtyar 2013). While these experimental studies indicate potential for chronic effects from synthetic based fluids, the exposure levels are not necessarily reflective of field

conditions. Potential effects on fish have also been suggested to be limited due to finfish mobility (CNSOPB 2005).

The text in Section 9.2.3.2 of the EIS will be amended to read as:

> "Lobsters exposed to high levels of SBM fluid in laboratory experiments, for example, did not change aspects of lipid and protein metabolism or have other adverse health effects after approximately 20 days (Hamoutene et al. 2004). Toxicity experiments with fish indicated that acute toxicity of SBMs was generally low (96-h LC50 toxicity of greater than 30,000 mg/L, Jagwani et al. 2011), but there were potential health effects with chronic exposure to SBM associated cuttings (Jagwani et al. 2011; Gagnon and Bakthyar 2013; Vincent-Akpu 2013). ***Gagnon and Bakhtyar (2013) investigated the effects of ester-based, isomerized olefin-based and linear alpha olefin-based drilling fluids on juvenile pink snapper under laboratory conditions. Exposure to these synthetic-based fluids resulted in EROD induction, accumulation of biliary metabolites and increase in stress proteins which are biomarkers for exposure to contaminants (Gagnon and Bakhtyar 2013).*** While these experimental studies indicate potential for chronic effects from synthetic based fluids, the exposure levels are not necessarily reflective of field conditions. Potential effects are likely to be temporary in nature as SBMs biodegrade within a few years (Terrens et al. 1998; Ellis et al. 2012; IOGP 2016). ***Laboratory studies of SBM fluid on marine sediments indicated that total petroleum hydrocarbon (TPH) levels degraded by approximately 31 percent and 14 percent in fresh and recycled synthetic-based fluids respectively after incubation at 5°C for four weeks (COOGER and Lee 2009). While degradation at seafloor temperatures would likely be slower, bacteria adapted to the cold-water environments may facilitate hydrocarbon degradation of in synthetic-based fluids (COOGER and Lee 2009).*** However, as degradation of the organic components of SBMs can lead to eutrophication and creation of anoxic environments that may have injury and mortality effects on benthic organisms (Schaanning et al. 2008; Ellis et al. 2012; Nguyen et al. 2018). The faster degradation rate of SBMs indicates that associated anoxic environmental effects may occur at a faster rate for SBM drilling cuttings deposition areas in comparison to areas of WBM cuttings deposition. However, a review of biological and physical effects from drill cuttings release indicated that the minimum and maximum areas of effect were higher for WBM cuttings discharge compared to SBM cuttings discharged (Ellis et al. 2012). ***Potential effects on fish have also been suggested to be limited due to finfish mobility (CNSOPB 2005).***"

References:

CNSOPB. 2005. Investigation Report: Discharge of Synthetic Based Drilling Mud During abandonment of the Crimson F-81 Exploration Well by Marathon Canada Petroleum ULC. CNSOPB, Halifax, NS. Available at: https://www.cnsopb.ns.ca/sites/default/files/pdfs/Marathon_Report.pdf. Accessed October 2018. Accessed October 2018.

COOGER (Centre for Offshore Oil, Gas and Energy Research) and K. Lee. 2009. Environmental Persistence of Drilling Muds and Fluid Discharges and Potential Impacts. Environmental Studies Research Funds Report No. 176. Dartmouth, 35 p.

Gagnon, M.M., and S. Bakhtyar. 2013. Induction of fish biomarkers by synthetic-based drilling muds. PloS one, 8(7): e69489.

	Hamoutene, D., J.F. Payne, C. Andrews, J. Wells, and J. Guiney. 2004. Effect of a Synthetic Drilling Fluid (IPAR) on Antioxidant Enzymes and Peroxisome Proliferation in the American Lobster, Homarus americanus. Canadian technical report of fisheries and aquatic sciences (2554), 15. USDOI MMS. 2004. Fate and Effects of a Spill of Synthetic-Based Drilling Fluid and Mississippi Canyon Block 778. OCS Report MMS 2004-039. US Department of the Interior, New Orleans, LA. 18 pp. Available at: https://www.boem.gov/BOEM-Newsroom/Library/Publications/2004/2004-039.aspx. Accessed October 2018. Vincent-Akpu, I.F. 2013. Chronic Toxicity of Synthetic Based Fluid (Parateq©) on growth of three life stages of *T. guineensis.* Scientific Research Journal, 1(3): 36-40.

IR-253 **CEAA-103**	**Guideline Ref:** Part 2, Section 7.3, Section 7.6, Section 7.6.1	**EIS Ref:** Section 16.7.4.5
Context/Rationale	Section 16.7.4.5 of the EIS states "Recent SBM spills in the Gulf of Mexico and in Atlantic Canada have also shown limited environmental effects with partial recovery within weeks or months of release and full recovery within a few years (USDOI MSS 2004; CNSOPB 2005; 2018 a,b)." This statement does not appear consistent with the CNSOPB references as there were no effects monitoring of the whole SBM spill from BP in 2018. This information is required for the Agency to review the assessment of effects from SBM spills.	
Request **15-Apr-19**	A. Explain how the references support the statement. B. Revise the statement on benthos condition related to whole SBM spill monitoring studies in Atlantic Canada, if required.	
Equinor Response **15-Nov-19**	A. The following information is provided to support the use of the references for the statement "Recent SBM spills in the Gulf of Mexico and in Atlantic Canada have also shown limited environmental effects with partial recovery within weeks or months of release and full recovery within a few years." **USDOI MMS. 2004. Fate and Effects of a Spill of Synthetic-Based Drilling Fluid and Mississippi Canyon Block 778. OCS Report MMS 2004-039. US Department of the Interior, New Orleans, LA. 18 pp. Available at: https://www.boem.gov/BOEM-Newsroom/Library/Publications/2004/2004-039.aspx. Accessed October 2018.** In May 2003, an offshore operator was completing drilling activities in approximately 1,841 m water depth (USDOI MMS 2004). Approximately 390 m³ of SBM was released from two locations where the riser parted (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. USDOI MMS (2004) concluded that the synthetic-based fluid spill would likely affect benthic species by smothering and/or creation of anoxic environment; however, mobile marine species would likely be able to avoid burial (USDOI MMS 2004). USDOI MMS (2004) did not indicate an affected area from the SBM spill; 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). Environmental effects on fish resources and	

	commercial fisheries were also considered negligible based on fish mobility, the dispersion of the synthetic-based fluid and non-toxic nature of synthetic-based fluid. **CNSOPB. 2005. Investigation Report: Discharge of Synthetic Based Drilling Mud During abandonment of the Crimson F-81 Exploration Well by Marathon Canada Petroleum ULC. CNSOPB, Halifax, NS. Available at: https://www.cnsopb.ns.ca/sites/default/files/pdfs/Marathon_Report.pdf. Accessed October 2018. Accessed October 2018.** In August 2004, an offshore operator was completing exploration drilling activities approximately 60 km south of Sable Island 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). Based on the environmental assessment completed by the operator in 2002, several benthic species were known to be 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 on the seafloor, assuming a 1 cm thickness, was estimated to be 35,000 m^2 and appeared to form a layer above the natural sediment (CNSOPB 2005). CNSOPB (2005) concluded that fish and mobile invertebrates are capable of avoiding SBM and were not expected to be affected. Benthic organisms and marine species that depend on retrieving food from sediment and species that have larvae settle within the sediment would likely be 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. **CNSOBP. 2018a. Unauthorized Discharge of Drilling Mud. Incident Bulletin, 22 June 2018. CNSOPB, Halifax, NS. Available at: https://www.cnsopb.ns.ca/media/incident-bulletins. Accessed October 2018.** **CNSOBP. 2018b. Approval to Recommence Drilling Operations Granted to BP Canada. Incident Bulletin, 23 July 2018. CNSOPB, Halifax, NS. Available at: https://www.cnsopb.ns.ca/media/incident-bulletins. Accessed October 2018** **CNSOPB. 2018c. Pre-Drilling Video Survey of the Seabed area round BP Canada well location. Available at: https://www.cnsopb.ns.ca/sites/default/files/pdfs/Pre-Drilling_Video_Survey_of_BP_Canada_Well_Location.pdf. Accessed October 2018** In June 2018, an offshore operator was completing exploration drilling activities approximately 330 km offshore Nova Scotia, 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). 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 2018b).

	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 2018c). 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 2018c). As outlined in CNSOPB (2018b), 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 this EIS. It is noted in CNSOPB (2018b) that SBM would settle to the seabed and therefore there is minimal potential for surface impacts to marine mammals or seabirds. CNSOPB (2018b) 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. Settled SBM may result in physical smothering of the seabed (CNSOPB 2018b), and could therefore impact benthic species, if present. However, effects are likely localized with recovery in a few years based on larger spills described above. B. Updates to the EIS are not required.

IR-254 **DFO-122**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.7.4.7, Table 16.37
Context/Rationale	It is not clear in Section 16.7.4.7 of the EIS how conclusions would change if a dispersant was used.	
Request **15-Apr-19**	Describe whether conclusions presented would change if a dispersant was used.	
Equinor Response **15-Nov-19**	The modelling and associated effects assessment of an accidental release of hydrocarbons are based on a worst-case scenario of an unmitigated spill as directed in Section 7.6.1 of the EIS Guidelines. The use of mitigations like chemical dispersants would lower the potential effects of an accidental hydrocarbon release and therefore would not be the worst-case scenario. Use of chemical dispersants is a mitigation that would break the oil into smaller droplets, enhancing natural dispersion and biodegradation processes. The use of spill treating agents reduces the risk of nearshore and shoreline interaction. The toxicity and potential environmental effects of dispersants on Marine Fish and Fish Habitat are considered in Section 16.7.4.4 of the EIS. Dispersants and their environmental effects considerations are also considered in spill response tactics (Table 16.1 of the EIS) and further information on considerations and application is provided in EIS Appendix N Well Intervention Response Strategies and Appendix O Additional Spill Response Information.	

IR-255 **CEAA-104**	**Guideline Ref:** Part 2, Section 7.3; Section 7.6; Section 7.6.1	**EIS Ref:** Section 16.7.4.7, Table 16.37; Section 16.7.5.6, Table 16.38
Context/Rationale	In Tables 16.37, 16.38, 16.39, 16.41 of Section 16.7.4.7 of the EIS, effects ratings from spill scenarios on marine fish, fish habitat, marine birds, marine mammals, sea turtles and special areas have the same rating without considering change in habitat, food, mortality, injury, health and presence or absence. This summary approach is not consistent with the effects assessment approach in Section 16 of the EIS. For example Section 16.7.4.6 "An extremely unlikely subsurface blowout has the potential to result in a change in habitat	

availability and quality, fish mortality, injury and health, and fish presence and abundance." Section 16.4.7.2 of the EIS states "The potential environmental effects on Marine Fish and Fish Habitat used in the assessment of effects of routine activities (Chapter 9) were:

- Change in habitat availability and quality
- Change in food availability and quality
- Change in fish and invertebrate mortality, injury, health
- Change in fish and invertebrate presence and abundance (behavioural effects)

These potential effects are relevant to the assessment of accidental events, although the mechanisms or pathways of effects may be different." Section 16.7.5.6 of the EIS states "In the extremely unlikely scenario of a subsurface blowout, there is the potential to result in a change in mortality or injury level and bird health, change in avifauna presence and abundance, change in habitat availability and quality, and change in food availability or quality."

A clear discussion with rationale on changes to valued components is needed for the Agency to assess environmental effects of accidental events.

Request
15-Apr-19

Provide the rationale for not including effects descriptors in Tables 16.37, 16.38, 16.39 and 16.41 for assessing changes in habitat, food, mortality, injury, health and presence or absence as described in Sections 16.7.4.2, 16.7.4.6 and 16.7.5.6 of the EIS.

Equinor Response
15-Nov-19

Upon review of the Tables 16.37, 16.38, 16.39 and 16.41, and 16.42, Equinor Canada realizes that the effects descriptors noted in for Fish and Fish Habitat, Marine and Migratory Birds, Special Areas and Indigenous Peoples VCs were omitted in error. Table 16.39; however, included the effects descriptors. The following edits will be made to Tables 16.37, 16.38, 16.41 and 16.44.

Table 16.37

Table 16.37 Summary of Residual Accidental Event-Related Environmental Effects on Fish and Fish Habitat

Accidental Event Scenario	Residual Environmental Effects Characterization						
	Nature	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Confidence
Potential Effects: Change in habitat availability and quality; Change in food availability and quality; Change in fish and invertebrate mortality, injury, health; Change in fish and invertebrate presence and abundance (behavioural effects)							

Table 16.38

Table 16.38 Summary of Residual Accidental Event-Related Environmental Effects on Marine and Migratory Birds

Accidental Event Scenario	Residual Environmental Effects Characterization						
	Nature	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Confidence
Potential Effects: Change in mortality / injury level and health of individuals or populations; Change in avifauna presence and abundance (behavioural effects); Change in habitat availability and quality; Change in food availability or quality							

Table 16.41

Table 16.41 Summary of Residual Accidental Event-Related Environmental Effects on Special Areas

Accidental Event Scenario	Residual Environmental Effects Characterization						
	Nature	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Confidence
Potential Effects: Change in environmental features and/or processes; Change in human use and/or societal value							

Table 16.44

Table 16.44 Summary of Residual Accidental Event-Related Environmental Effects on Indigenous Peoples: Commercial-Communal Fisheries

Accidental Event Scenario	Residual Environmental Effects Characterization						
	Nature	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Confidence
Potential Effects: Change in commercial-communal fisheries; Change in current use of lands and resources for traditional purposes							

IR-256	**Guideline Ref:** Part 2, Section 7.3.1, Section 7.6.1	**EIS Ref:** Section 16.7.4.8
DFO-123		
Context/Rationale	In Section 16.7.4.8 of the EIS, the prediction of minimal interactions with benthic habitat is not supported by the observations in the Gulf of Mexico after the Deepwater Horizon blowout.	
Request 15-Apr-19	Describe potential effects on benthic habitat, given observations from the Deepwater Horizon blowout.	
Equinor Response 15-Nov-19	The Deepwater Horizon oil spill and associated studies provide insight into potential effects of hydrocarbon release in deep-water environments. As noted in Section 16.7.4.3 of the EIS, microbial interactions are a potential pathway for biodegradation and moving oil from surface waters to the deep ocean. Overall concentrations that may reach the seabed are dependent on degradation rates, oceanographic processes, flocculant composition, and other factors that influence shuttling oil to the deep sea (Passow et al.	

	2012; Daly et al. 2016; Hazen 2018). However, the Deepwater Horizon incident was both complex and response mitigated. Many of the hypothetical effects, change from baseline, total quantity, and fates processes are still not very well documented sufficient degree of scientific accuracy to model. There were interactions of factors specific to the Deepwater Horizon spill that may have influenced direction of hydrocarbon to benthic habitats including interaction of released oil with sediments, drilling muds, and other material deposited to seal the leaking well during the oil spill response (Appendix E of the EIS). For example, the Deepwater Horizon spill was the first occurrence of applying dispersants directly to the wellhead (Hazen 2018). These factors, in combination with well depth and hydrostatic pressures, and enhanced nutrients from the Mississippi River, would have also had effects on the microbial communities and affect biodegradation rates and microbial pathways for transfer of hydrocarbons (Hazen 2018). One can therefore not make a direct comparison of potential benthic effects from Deepwater Horizon to a hypothetical unmitigated release. Effects to benthic habitat including corals and sponges are described in Section 16.7.4.3 of the EIS and reference various studies from the Deepwater Horizon Spill (e.g., Hsing et al. 2013; Montagna et al. 2013; Fisher et al. 2014; and Hourigan et al. 2017). In addition, as stated in response to IR-66/DFO-50 additional information regarding effects to benthic invertebrates, with reference to the Deepwater Horizon spill, will be added to Section 16.7.4.3 of the EIS. Additional updates to the EIS are not required. References: Daly, K L., U. Passow, J. Chanton, and D. Hollander. 2016. Assessing the impacts of oil-associated marine snow formation and sedimentation during and after the Deepwater Horizon oil spill. Anthropocene, 13: 18-33. Fisher, C.R., P.-Y. Hsing, C.L. Kaiser, D.R. Yoerger, H.H. Roberts, W.W. Shedd, and J.M. Brooks. 2014. Footprint of Deepwater Horizon blowout impact to deep-water coral communities. Proceedings of the National Academy of Sciences, 111(32): 11744–11749. French-McCay, D., Li, Z., Horn, M., Crowley, D., Spaulding, M., Mendelsohn, D., & Turner, C. 2016. Modeling oil fate and subsurface exposure concentrations from the Deepwater Horizon oil spill. In Proceedings of the 39th AMOP Technical Seminar on Environmental Contamination and Response, Emergencies Science Division, Environment Canada, Ottawa, ON, Canada (pp. 115-150). Hazen, T.C. 2018. Lessons from the 2010 Deepwater Horizon Accident in the Gulf of Mexico. Hydrocarbons, Oils and Lipids: Diversity, Origin, Chemistry and Fate, 1-19. Hourigan, T.F., P.J. Etnoyer, and S.D. Cairns. 2017. The State of Deep-Sea Coral and Sponge Ecosystems of the United States. NOAA Technical Memorandum NMFS-OHC-4. Silver Spring, MD, 467 pp. Hsing, P.Y., B. Fu, E.A. Larcom, S.P. Berlet, T.M. Shank, A.F. Govindarajan, A.J. Lukasiewicz, P.M. Dixon, and C.R. Fisher. 2013. Evidence of lasting impact of the Deepwater Horizon oil spill on a deep Gulf of Mexico coral community. Elementa: Science of the Anthropocene, 1:12. Montagna, P.A., J.G. Baguley, C. Cooksey, I. Hartwell, L.J. Hyde, J.L. Hyland, R.D. Kalke, L.M. Kracker, M. Reuscher, and A.C.E. Rhodes. 2013. Deep-sea benthic footprint of the Deepwater Horizon blowout. PLoS ONE, 8:e70540. Passow, U. 2016. Formation of rapidly sinking, oil-associated marine snow. Deep Sea Research Part II: Topical Studies in Oceanography, 129: 232-240.

IR-257 DFO-124	**Guideline Ref:** Part 2, Section 7.3.1, Section 7.6.1	**EIS Ref:** Section 16.7.4.8
Context/Rationale	The Flemish Pass has been shown to be a critical area for the dispersal of the larvae of economically important invertebrates like shrimp (Le Corre et al. 2018) and vulnerable benthic organisms such as corals and sponges (Kenchington et al. 2018). As such, it provides connectivity for vulnerable marine ecosystems and for shrimp recruitment. The effect of an oil spill on this connectivity should be assessed in Section 16.7.4.8 of the EIS.	
Request 15-Apr-19	Describe effects of an oil spill on connectivity in Section 16.7.4.8 of the EIS.	
Equinor Response 15-Nov-19	Le Corre et al. (2018) provides information on the connectivity patterns among management units for northern shrimp (*Pandalus borealis*) by modelling larval dispersal. The model indicates that Shrimp Fishing Area (SFA) 7, which includes the Flemish Pass, receives recruits from northern areas (e.g., SFA 5 and SFA 6) along the Newfoundland and Labrador Shelf (Le Corre et al. 2018). Potential recruits from SFA 7 generally do not reach suitable habitat in the model and are not recruited to an SFA (Le Corre et al. 2018). Average potential settlement density to offshore sites (200-1,000 m depth) in SFA7 was also relatively low (<2 settlers/km²) relative to other SFAs (Le Corre et al. 2018). Le Corre et al. (2018) note that “SFA 7 acts mostly as a “sink” area sustained primarily by settlers from northern areas, and releasing larvae that rarely reach suitable habitats within the competency period (NAFO & ICES, 2017).” The results of this research do not support the Flemish Pass as a critical area of dispersal for northern shrimp. Kenchington et al. (2019) was cited as Kenchington et al. (2018) in Section 6.1.7.6 of the EIS as the work was “in press” at the time of writing. Kenchington et al. (2019) used particle tracking (surface and 100 m depths) and Nucleus for European Modelling of the Ocean (NEMO) (1,000 m and sea floor depths) models across seasonal scenarios to assess larval connectivity among Fisheries Closure Areas (FCAs) on the Grand Bank and Flemish Cap. Flemish Cap Area 10 is within the BdN Project Area and was closed to fishing for protection of sea pens. This area was assessed in relation to other sea pen closure areas. Area 10 shows structural connectivity with Area 14 on the outside of the Flemish Cap (Kenchington et al. 2019). Therefore, based on oceanographic processes, Area 10 potentially provides larval recruits to Area 14 (Kenchington et al. 2019). Area 10 is suggested to receive recruits from Area 9 (Northwestern Flemish Cap) and Area 12 (Northwestern Flemish Cap) and is not indicated to retain recruits from within the FCA (Kenchington et al. 2019). The models suggest that the FCAs established for sea pens show a weak network of connectivity by oceanographic processes. However, with the limited information on biological traits of sea pens, Kenchington et al. (2019) indicate that they cannot confirm effective connectivity where it is demonstrated there is successful settlement and survivorship of larvae from one closure area to another. The preliminary work from Kenchington et al. (2019) suggest connectivity of invertebrates on the Flemish Cap. The potential effects of an unmitigated oil spill has been assessed in Section 16.7.4.3 of the EIS including effects on fish and invertebrate larvae. As noted in the EIS, “since most fish and invertebrate species have one or more life stages in a planktonic phase, there is potential effect on recruitment into the adult fish and invertebrate population,” An unmitigated spill event affecting on larvae in the Flemish Pass could potentially lower recruitment to other areas of the Flemish Cap and therefore potentially lower connectivity. Potential effects on source adult populations may also lower recruitment to and connectivity among areas, thereby slowing recovery and recolonization. However, the potential effects of an unmitigated spill event on connectivity would be dependent on the level of hydrocarbon exposure, and life history traits (e.g.,	

	generation times, larval dispersal) and would vary among taxa (See Section 16.7.4.3 of the EIS). For corals in particular, it is noted in the Section 16.7.4.3 of the EIS that "adverse effects on early life stages can lower recruitment and potentially slow recovery of coral recolonization in areas affected by accidental events. Regeneration and recovery from injury may also lead to sublethal effects including reduced growth, impaired reproduction processes, and decreased predation defence due to reallocation of energetic and cellular resources (Henry and Hart 2005)." For clarification, the text in Section 16.7.4.3 of the EIS will be amended to read as: "The potential longer-term effects of plankton and microbe mortality due to exposure to hydrocarbons is twofold: (1) they are an important food source for higher trophic levels (e.g., fish and invertebrates), and (2) since most fish and invertebrate species have one or more life stages in a planktonic phase, there is potential effect on recruitment into the adult fish and invertebrate population ***and connectivity among areas***." For clarification, the text in Section 16.7.4.3 of the EIS will be amended to read as: "Considering the long development times (Baillon et al. 2015) and slow growth in cold-water corals, these adverse effects on early life stages can lower recruitment and potentially slow recovery of coral recolonization in areas affected by accidental events. Regeneration and recovery from injury may also lead to sublethal effects including reduced growth, impaired reproduction processes, and decreased predation defence due to reallocation of energetic and cellular resources (Henry and Hart 2005). ***Recovery of corals from accidental events may also be slowed through loss of connectivity (Kenchington et al. 2019) from potential adverse effects on larvae or adults."*** The additional information does not change conclusions of the EIS. References: Baillon, S., J.-F. Hamel, and A. Mercier. 2015. Protracted oogenesis and annual reproductive periodicity in the deep-sea pennatulacean *Halipteris finmarchica* (Anthozoa, Octocorallia). Marine ecology, 36(4): 1364-1378. Henry, L.-A. and M. Hart. 2005. Regeneration from Injury and Resource Allocation in Sponges and Corals–a Review. International Review of Hydrobiology, 90(2): 125-158. ***Kenchington, E., Z. Wang, C. Lirette, F.J. Murillo, J. Guijarro, I. Yashayaev, and M. Maldonado. 2019. Connectivity modelling of areas closed to protect vulnerable marine ecosystems in the northwest Atlantic. Deep Sea Research Part I: Oceanographic Research Papers. 143, 85-103.*** ***Le Corre, N., Pepin, P., Han, G., Ma, Z., and P.V. Snelgrove. 2019. Assessing connectivity patterns among management units of the Newfoundland and Labrador shrimp population. Fisheries Oceanography, 28(2), 183-202.***

IR-258 **CEAA-105**	**Guideline Ref:** Part 2, Section 7.3; Section 7.6, Section 7.6.1	**EIS Ref:** Section 16.7.7.2
Context/Rationale	In Section 16.7.7.2 of the EIS, it is recognized that Special Areas have ecological integrity that may be degraded by oil spills and thus the biological or ecological function may be compromised. However, the valued components are not discussed in this ecosystem context, as required in Sections 3.22, 4.3 and 7.2 of the EIS Guidelines or as committed to	

	in Section 4.0 of the EIS. Zones of influence were not overlaid using mapping over the Special Areas.
Request 15-Apr-19	Discuss the ecological function and value of the marine biota and habitat to determine how integrity and function may be affected by the Project. Assessment should use zones of influence modeled from the Project activities.
Equinor Response 15-Nov-19	See responses to IR-65/DFO-51, IR-67/DFO-52, IR-69/DFO-55 and IR-251/CEAA-101.

IR-259	**Guideline Ref:** Part 2, Section 7.6.3, Part 2, Section 9.0	**EIS Ref:** Section 15.9
Conformity DFO-6		
Context/Rationale	The EIS Guidelines require that the Proponent present a preliminary follow-up program. The statement “No additional follow-up is required or proposed related specifically to potential cumulative environmental effects” is in contrast to a precautionary approach in which potentially problematic issues are addressed further such as through directed studies. The proponent does not propose any additional monitoring for cumulative effects beyond what is already indicated for each VC. This gap should be addressed.	
Request 15-Apr-19	Provide the rationale why follow-up or monitoring programs specific for cumulative effects is not provided.	
Equinor Response 15-Nov-19	As noted in the response to IR-146/Conformity ECCC-4;ECCC-25 and throughout the EIS, the structure and content of monitoring and follow-up programs will be determined once Project design is finalized. As is the case with other development projects in offshore NL, follow-up programs will be developed in consultation with the C-NLOPB and relevant government departments (DFO, ECCC) and through engagement with Indigenous groups. Proposed revisions to the text of the EIS to clarify the objectives and rationale of monitoring and follow-up programs are set out in the response to IR-146/Conformity ECCC-4;ECCC-25. Follow-up programs that have been identified and described for VCs as part of the Project-specific environmental effects assessment (Chapters 8 to 13) are equally relevant to cumulative effects, since such Project-specific effects relate to the Project’s potential contribution to cumulative effects in the region. Since it is the conclusion of the EIS (Section 15.9) that the Project is not likely to result in adverse cumulative effects in combination with other projects and activities in the region that have been or will be carried out and the relative contribution of the Project and its potential effects within the RSA will be low, no additional or follow-up is required or proposed related specifically to potential cumulative effects. As stated in the EIS, for the operating oil and gas production activities in the NL offshore, EEM programs are concluding that effects from production projects are relatively localized to the production facility. In the Norwegian Continental Shelf (NCS) the approach to effects monitoring for benthic habitats is captured in a regional environmental effects monitoring program, which are carried out every three years (Norwegian Environmental Agency 2015). The regional approach divides the NCS into regions. The number of production operations in the regions ranges from one to 29. The number of sampling stations in any one region ranges from 35 to as many as 205. Rather than each operator undertaking a separate EEM program, operators in the same region participate in the regional EEM program. As an example, in Region II of the NCS regional EEM area, there are 29 operations in an area of approximately 48,700 km^2. Figure 1 below illustrates the size of this area relative to the Jeanne d’Arc and Flemish Pass areas where there are currently only four production operations. Results from the NCS regional EEM programs	

have shown that effects are localized and for the entire area, less than 0.10 percent of the total area is impacted in these regions where petroleum activities are occurring (Renaud et al 2008).

Updates to the EIS are not required.

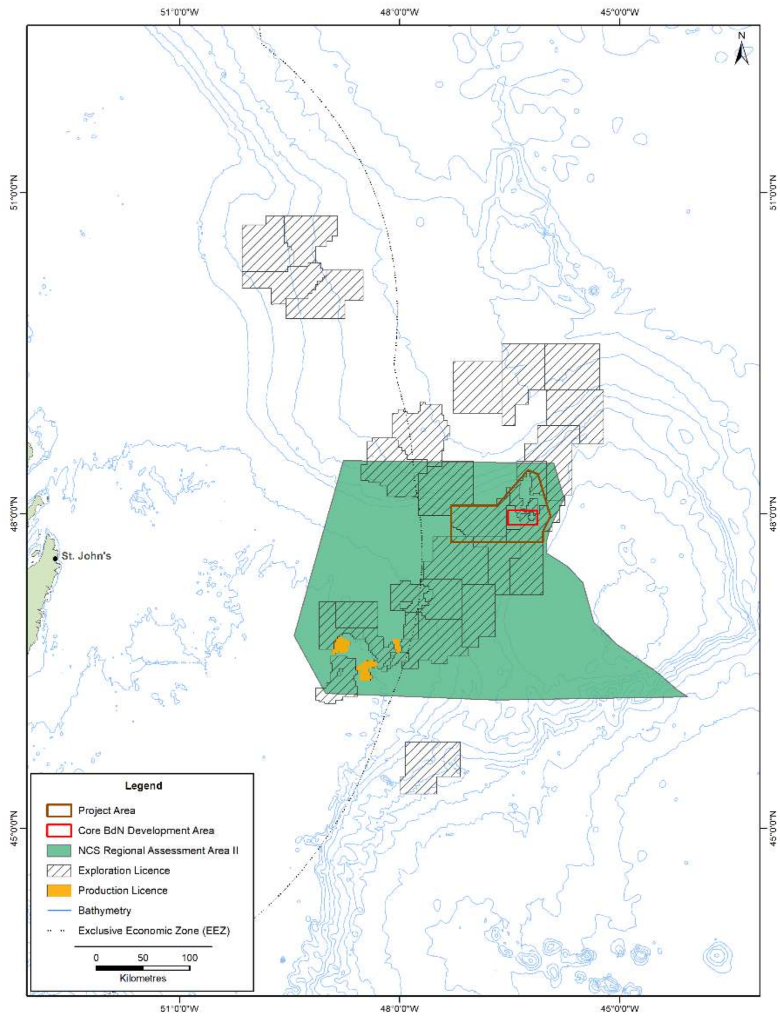


Figure 1: Illustration of NCS Regional Monitoring area relative to NL offshore area

References:

Norwegian Environmental Agency. 2015. Guidelines for Environmental Monitoring of Petroleum Activities on the Norwegian Continental Shelf. M-408/2015.

Renaud, Paul E, T. Jensen, I. Wassbotten, H.P. Mannvik, H. Botnen. 2008. Offshore Sediment monitoring on the Norwegian Shelf – A Regional Approach 1996-2006. Akvaplan-niva AS Rapport 2487-003.

IR-260 **DFO-40**	**Guideline Ref:** Part 2, Section 9.2	**EIS Ref:** Section 2.10.16; Section 15.9
Context/Rationale	Section 9.0 of the EIS Guidelines requires information pertaining to follow up and monitoring programs. Section 2.10.6 of the EIS states "If required, Proponent will conduct an EEM to validate EIS predictions". Section 4.3.3 of the EIS states that "Each VC Chapter also provides an overview discussion of environmental monitoring and or follow-up program…This includes, where applicable, a preliminary overview of its: rationale and objectives; planning and design; key areas of focus; implementation and schedule; the format, use and sharing of study results; and potential adaptive management approaches based on the results and findings of such programs." Monitoring information was not provided in the VC chapters and is required to verify prediction of effects the EIS.	
Request **15-Apr-19**	Provide details of the potential EEM programs in Section 15.9 of the EIS.	
Equinor Response **15-Nov-19**	See responses to IR-146/Conformity ECCC-4;ECCC-25 and IR-259/Conformity DFO-6	

IR-261 **NRCan-8**	**Guideline Ref:** Part 2, Section 7.1.2, Section 7.6	**EIS Ref:** Section 17.2.1
Context/Rationale	According to the National Earthquake Database (NRCan 2017c) there have been no seismic events recorded within the boundaries of the Project Area within the 1985 to 2018 period, with the closest recorded event having occurred over at least 300 km away. Seismic events have far ranging impacts away from the epicenter, therefore the assumption in Section 17.2.1 of the EIS that unless an earthquake is in the Project Area there is no effects is not accurate.	
Request **15-Apr-19**	Provide a broad regional assessment of sediment failure risk, with respect to seismicity, as shaking can have an impact on sediment from many kilometres away.	
Equinor Response **15-Nov-19**	It is noted in Section 17.2.1 of the EIS that there are no seismic events in the Project Area from 1985 to 2018 and the closest recorded event is over 300 km away. In terms of risk of earthquake effects, the Piper and Campbell (2015) regional geohazard assessment is referenced, where it is suggested that most large debris flow deposits in the area are the result of earthquake-triggered slumps on both flanks of the Flemish Pass. It would likely take a major earthquake in the northern Flemish Pass to trigger future landslides; Cameron et al. (2014) estimated such a quake could have a recurrence rate of approximately 10,000 years in a worst-case scenario. This is consistent with the findings of a review of existing geophysical and geotechnical data from the Flemish Pass region, used to develop a geohazard assessment (Fugro 2017). The sediment failure risk is addressed. The information in the EIS is complete.	

IR-262 **NRCan-9**	**Guideline Ref:** Part 2, Section 7.1.2, Section 7.6	**EIS Ref:** Section 17.2.1
Context/Rationale	NRCan analysis indicates that in any given area in the offshore of eastern Canada, there is a risk of a landslide every 20,000 years and a minor one may occur every few thousand	

	years (NRCan 2010). It is likely that most failures are earthquake triggered, with some seismicity induced by glacio-isostasy (Piper 2005). These major sediment failures occurred 27,000 and 20,500 years ago and are believed to have been a result of earthquake triggers (Cameron et al. 2014). This is consistent with the findings of a review of existing geophysical and geotechnical data from the Flemish Pass region, used to develop a geohazard assessment (Fugro 2017). The results of a slope stability evaluation in the Project Area indicate that a triggering event of greater magnitude than the 3,000-year recurrence interval Abnormal Level Earthquake event is required for slope instability over large areas of the Flemish Pass flanks. This is consistent with the age estimates and observed recurrence intervals of the three basin-wide slope failure events / mass-transport deposits, the results of which indicate relatively low landslide likelihood across a large proportion of the Project Area (Fugro 2017).
Request **15-Apr-19**	Provide the role of preconditioning factors for sediment stability in the Flemish Pass Region, in particular shallow fluids, gas hydrates and excess pore pressure.
Equinor Response **15-Nov-19**	Pre-conditioning factors are a set of local, regional or global conditions which can make a slope more prone to failure. Some of these factors, such as high sedimentation rate, are thought to have been present in connection with ice ages but are no longer present in the majority of the Flemish Pass. Pore pressure was measured in two locations in the project area in 2015. The results indicate no excess pore pressure in either borehole (NGI 2016). In addition, based on data from a 2015 soil investigation study in the Project area (NGI 2015) up to 100 m below seabed there is no indication of increased pore pressures being present. With regards to gas hydrates and shallow gas refer to response to IR-41/NRCan-6. References: NGI (2016), "ST15452 Flemish Pass Geotechnical Investigation – data interpretation and evaluation", report nr. 20140857-02-R, dated 2016-05-30"

IR-263 **NRCan-10**	**Guideline Ref:** Part 2, Section 7.1.2, Section 7.6	**EIS Ref:** Section 17.2.1
Context/Rationale	Oil and gas activities have been conducted safely in areas where submarine landslides have occurred. Ormen Lange is a production (gas) field in 850 m to 1,100 m water in the Norwegian Sea and is located at the site of a submarine clay landslide. The Ormen Lange field development activities had negligible effects on stability and was determined to not trigger tsunami-generating slides, as a slide risk assessment indicated that only natural causes (i.e., extremely strong earthquake) are a realistic trigger mechanism. The annual probability of a slide with a run out of the field development area is almost zero (Scandpower 2004). Hazards related to the Ormen Lange subsea processing facilities from landslide risks were determined to be negligible (10 to 6 / year) (Nadim et al. 2005; Lloyd's Register Consulting 2013).	
Request **15-Apr-19**	Provide the landslide risk as a result of blowout and any contingency plan or mitigation measures in place if such an accident were to occur.	
Equinor Response **15-Nov-19**	Sediment stability is addressed in response to IR-262/NRCan-9. In accordance with the Section 7.6.1 of the EIS Guidelines, the EIS provides the probability and effects assessment of a "plausible worst-case accidental event". As stated	

	in Section 16.2.4 and Section 16.4, a blowout from drilling is the credible worst-case scenario assessed. Section 16.4 provides a detailed environmental effects analysis of a blowout on the receiving environment. Mitigations to prevent accidental events are addressed in Section 16.1.1 and Section 16.1.2 provides an overview of emergency response measures to be implement in the event of an accidental event. The EIS is complete. Updates to EIS are not required.

IR-264 **DFO-127**	**Guideline Ref:** Part 2, Section 7.3.1, Section 7.6.1	**EIS Ref:** Appendix E
Context/Rationale	In Appendix E of the EIS, the statement was made "Footprints depicting higher probability contours (90%) are much smaller than the total footprint (>1%), which range from 526,900 – 1,436,000 km² depending on the scenario." (Page viii), but these numbers are inaccurate because in many occasions the spill patch is truncated by the model domain that is too small. In Appendix E of the EIS, reference should be provided for the statement "From 0 to ~30% coverage, the ice has no effect on the advection or weathering of surface floating oil. From approximately 30 to 80% ice coverage, oil advection is forced to the right of ice motion in the northern hemisphere, surface oil thickness generally increases due to ice-restricted spreading, and evaporation and entrainment are both reduced by damping/shielding the water surface from wind and waves. Above 80% ice coverage, surface oil moves with the ice and evaporation and entrainment cease." (Page 23), as it is unclear why advection should be directed right of the ice motion. Appendix E of the EIS states that the use of a dispersant (SSDI) will increase the exposure of organisms inhabiting the deep water, however densities of fish and invertebrates in deep water are much lower "mitigating this potential impact" (Page 40, paragraph 2). DFO is of the view that the impact should be discussed based on population affected rather than density.	
Request **15-Apr-19**	A. Revise statement considering the size of the model domain in Appendix E. B. Provide a reference regarding advection. C. Revise assessment of impacts on organisms inhabiting deep water, with consideration of populations or provide justification why the use of densities rather than populations is sufficient	
Equinor Response **15-Nov-19**	A. The statement in Appendix E will be revised to read: "Footprints depicting higher probability contours (90%) are much smaller than the total footprint (>1%), which range from 526,900 – 1,436,000 km² ***of the modelled domain*** depending on the scenario." B. As noted in EIS Appendix E: "From 0 to ~30% coverage, the ice has no effect on the advection or weathering of surface floating oil. From approximately 30 to 80% ice coverage, oil advection is forced to the right of ice motion in the northern hemisphere, surface oil thickness generally increases due to ice-restricted spreading, and evaporation and entrainment are both reduced by damping/shielding the water surface from wind and waves. Above 80% ice coverage, surface oil moves with the ice and evaporation and entrainment cease." This statement notes that oil moves on the water surface as essentially ice-free from 0-30% coverage. However, the ice increasingly impacts trajectory and fate as coverage increases from 30-80%. Essentially a combination of water/ice movement between 30-80%, with resulting wind drift angle	

	between that of the water and oil (i.e. combination). Above 80%, the movement of the oil is with the ice. The oil advection being to the right of ice motion in the northern hemisphere is due to the Coriolis effect and the velocity is a fractional percentage of wind/ice speed noted as wind drift. References to support these statements are provided below. C. The effects of hydrocarbon release on deep-water organisms at individual effects and population levels are described in EIS S.16.7.4.3. Updates to the EIS are not required. References for Part B. French McCay, D. R. Balouskus, J. Ducharme, M. Schroeder Gearon, Y. Kim, S. Zamorski, Z. Li, and J. Rowe. 2016. Simulation of oil spill trajectories during the broken ice period in the Chukchi and Beaufort Seas, Prepared for U.S. Fish and Wildlife Service, Marine Mammals Management, Anchorage, Alaska, 189 pp. French McCay, D., R. Balouskus, J. Ducharme, M. Schroeder Gearon, Y. Kim, S. Zamorski, Z.Li, and J. Rowe, 2017. Potential Oil Trajectories and Surface Oil Exposure from Hypothetical Discharges in the Chukchi and Beaufort Seas. Proceedings of the 40th AMOP Technical Seminar on Environmental Contamination and Response, Emergencies Science Division, Environment Canada, Ottawa, ON. pp. 660-693. French McCay, D., M.S. Gearon, Y.H. Kim, K. Jayko and T. Isaji, 2014. Modeling Oil Transport and Fate in the Beaufort Sea. In Proceedings of the 37th AMOP Technical Seminar on Environmental Contamination and Response, Emergencies Science Division, Environment Canada, Ottawa, ON. French-McCay, D.P., T. Tajalli-Bakhsh, K. Jayko, M. L. Spaulding, and Z. Li, 2018. Validation of oil spill transport and fate modeling in Arctic ice. Arctic Science 4: 71-97. dx.doi.org/10.1139/as-2017-0027. French McCay, D., T. Tajalli Bakhsh, and M.L. Spaulding, 2017. Evaluation of Oil Spill Modeling in Ice Against In Situ Drifter Data from the Beaufort Sea In: Proceedings, International Oil Spill Conference, May 2017, Paper 2017-356, American Petroleum Institute, Washington, DC. Wilson, Ryan R., Craig Perham, Deborah P. French-McCay, Richard Balouskus, 2018. Potential impacts of offshore oil spills on polar bears in the Chukchi Sea, Environmental Pollution, 235: 652-659, ISSN 0269-7491, https://doi.org/10.1016/j.envpol.2017.12.057.

IR-265 **DFO-128**	**Guideline Ref:** Part 2, Section 7.3.1, Section 7.6.1	**EIS Ref:** Appendix E
Context/Rationale	The model used in Appendix E of the EIS does not consider the observations from the Deepwater Horizon (DWH) blowout that a significant portion of the oil was found on deepwater coral and sponge reefs in the area. The model only deals with oil, but does not assess the behavior, fate and potential effects of the hydrocarbon gasses associated with oil. Again, the DWH spill has demonstrated that the effects of such gas may be significant for planktonic organisms. This gap needs to be addressed.	
Request **15-Apr-19**	A. Justify why observations from the Deepwater Horizon blowout regarding deepwater coral and sponge reefs were not considered in this model or update assessment of potential effects on sensitive benthic species in Appendix E of the EIS.	

	B. Provide assessment of the behavior, fate and potential effects of hydrocarbon gasses associated with oil, on planktonic organisms.
Equinor Response 15-Nov-19	A. The model considers gases in the formulation of predicted oil droplet size distribution. However, the comment is correct. In these scenarios, the gases were not modelled in the far field simulations. There can be limited effects from gases, but they are typically contained within several km of the release and will not typically extend far beyond. The gases are bioactive and will degrade relatively quickly compared to heavier ends of the hydrocarbons. Studies have demonstrated that gas is not the primary cause of toxicity to planktonic organisms as the gas would dissolve quickly at depth, as it did in the DWH spill (Valentine et al. 2010; Kessler et al. 2011a, 2011b; Ryerson et al. 2011, 2012), and would not be expected to contribute much to water column toxicity (Paquin et al. 2018), oil hydrocarbon (C_6+) fate are the focus of analyses using SIMAP. A suspended concentration of 10 mg/L (conservatively high for offshore environments) was used in the model and did allow for a small amount of the release (<0.01% of the total release) to settle to the bottom within the 160 day time span for this unmitigated release. This is the contamination that would be predicted to effect deep-water coral and sponge reefs. References to support these statements are provided below. The modelled scenarios were completely unmitigated. The Deepwater Horizon incident was a mitigated release that involved numerous response tactics including cap and contain, junk shots, top kills, subsurface dispersant injection, surface dispersant application, herding, burning, etc. Each of these activities would result in potential changes to the trajectory and fate of released oil. There were observations of hydrocarbons on sediments, deep-water corals, and sponge reefs. However, analysis is still underway, papers are stilling being written and there has not been a scientific consensus on the fates pathways and relative amounts of hydrocarbons that may sink as a result of an unmitigated or response mitigated release. The SIMAP modelling approach does contain the current state of knowledge (i.e., state-of-the-art), has been validated against real world releases, and does continue to be developed based upon laboratory and field studies. However, without scientific consensus related to this new information, the model did not include these factors. Some active areas of international research include studies of oil weathering, sinking, toxicity and others (see also response to IR-267/DFO 156). B. The effects of accidental release of hydrocarbons on plankton is discussed in Section 16.7.4.3 of the EIS. This includes the ultimate effects on planktonic organisms from the Deepwater Horizon spill. As noted, in the response to Part A, studies have demonstrated that gas is not the primary cause of toxicity to planktonic organisms as the gas would dissolve quickly at depth and would not be expected to contribute much to water column toxicity. The text in Section 16.7.4.3 will be amended to read as: "Laboratory exposure studies found that an Arctic copepod species, *Calanus glacialis*, was less sensitive to oil exposure compared to a temperate-boreal copepod species (*C. finmarchicus*) due to higher lipid content and slower hydrocarbon uptake in cold water (Hansen et al. 2011; Gardiner et al. 2013). ***Hydrocarbon gases are produced from the separation of hydrocarbon phases during the ascent towards the surface from deep waters (Joye et al. 2011) with potential hydrocarbon effects on planktonic organisms. Spatially, these gases are limited to within several kilometres of the releases source and will not typically extend far beyond. However, gases have been***

	demonstrated to not be the primary cause of toxicity to planktonic organisms as the gases are bioactive and will degrade relatively quickly compared to heavier ends of the hydrocarbons (Valentine et al. 2010; Kessler et al. 2011a, 2011b; Ryerson et al. 2011, 2012). This hydrocarbon pathway would not be expected to contribute much to water column toxicity (Paquin et al. 2018), therefore, oil hydrocarbon (C_6+) fate are the focus of modelling using SIMAP (Appendix E)." References: (Part A) Joye, S.B., I.R. MacDonald, I., Leifer, and V. Asper. 2011. Magnitude and oxidation potential of hydrocarbon gases released from the BP oil well blowout. Nature Geoscience, 4(3), 160. Kessler J.D., D.L. Valentine, M.C. Redmond, and M. Du. 2011. Response to Comment on "A persistent oxygen anomaly reveals the fate of spilled methane in the deep Gulf of Mexico". Science, 332: 1033. Kessler, J. D., D. L. Valentine, M. C. Redmond, M. Du, E. W. Chan, S. D. Mendes, E. W. Quiroz, C. J. Villanueva, S. S. Shusta, L. M. Werra, S. A. Yvon-Lewis and T. C. Weber. 2011. A persistent oxygen anomaly reveals the fate of spilled methane in the deep Gulf of Mexico. Science, 331: 312-315. Paquin, P.R., J. McGrath, C.J. Fanelli, and D.M. Di Toro, 2018. The aquatic hazard of hydrocarbon liquids and gases and the modulating role of pressure on dissolved gas and oil toxicity. Mar. Pollut. Bull.,133: 930-942. Ryerson, T.B., K. C. Aikin, W. M. Angevine, E. L. Atlas, D. R. Blake, C. A. Brock, F. C. Fehsenfeld, R.-S. Gao, J. A. de Gouw, D. W. Fahey, J. S. Holloway, D. A. Lack, R. A. Lueb, S. Meinardi, A. M. Middlebrook, D. M. Murphy, J. A. Neuman, J. B. Nowak, D. D. Parrish, J. Peischl, A. E. Perring, I. B. Pollack, A. R. Ravishankara, J. M. Roberts, J. P. Schwarz, J. R. Spackman, H. Stark, C. Warneke, and L. A. Watts, 2011. Atmospheric emissions from the Deepwater Horizon spill constrain air-water partitioning, hydrocarbon fate, and leak rate. Geophysical Research Letters, 38: L07803, doi:10.1029/2011GL046726. Ryerson, T.B., R. Camilli, J. D. Kessler, E. B. Kujawinski, C. M. Reddy, D. L. Valentine, E. Atlas, D. R. Blake, J. De Gouw, S. Meinardi, D. D. Parrish, J. Peischl, J. S. Seewald and C. Warneke. 2012. Chemical data quantify Deepwater Horizon hydrocarbon flow rate and environmental distribution. Proceedings of the National Academy of Sciences, 109(50): 20246-20253. Valentine, D. L. K., J.D.; Redmond, M.C.; Mendes, S.D.; Heintz, M.B.; Farwell, C.; Hu, L.; Kinnaman, F.S.; Yvon-Lewis, S.; Du, M.; Chan, E.W.; Tigreros, F.G.; Villanueva, C.J. 2010. Propane respiration jump-starts microbial response to a deep oil spill. Science, 330: 208-211.

IR-266 **ECCC-38**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Section 16.4.2; Appendix E, Section 3.4; Appendix E, Section 3.5
Context/Rationale	In Section 16.4.2 of the EIS and Appendix E, it is unclear which wind and current data was used in the spill modelling scenarios. Paragraph two states "for this study, daily current data were obtained for the period **January 2006 to December 2010** for the North Atlantic Region. With respect to winds,	

	paragraph three states "All data were acquired for the period between 2006 and 2010 (see Section 3 of Appendix E in the EIS for details)." With respect to wind data, paragraph two states "Wind data for this study were obtained for the entire model domain (Figure 2-1) from the National Centers for Environmental Prediction (NCEP) Climate Forecast System Reanalysis (CFSR) product for **2006 through 2010. Another two years (2011-2012) of wind data was added** to the analysis from CFSv2, which used the same model that was used to create CFSR and thus works as an extension of CFSR." Paragraph one states, "For this study, daily HYCOM current data were obtained for the period **January 2006 through December 2012** for the North Atlantic region (HYCOME, 2016)."
Request 15-Apr-19	Confirm whether current and wind data used in the spill modelling scenarios spanned the years from 2006 through 2010, or 2006 through 2012, in Section 16.4.2 and Appendix E.
Equinor Response 15-Nov-19	Daily HYCOM currents and 6-hourly CFSR winds were used from 2006-2012. The text in Section 16.4.2 will be amended as follows: "Currents for the North Atlantic region were acquired from the US Navy Global HYCOM (HYbrid Coordinate Ocean Model) circulation model. For this study, daily current data were obtained for the period January 2006 through December ***2012*** ~~2010~~ for the North Atlantic region." "Climate Forecast System Reanalysis (CFSR) model. All data were acquired for the period between 2006 and ***2012*** ~~2010~~ (see Section 3 of Appendix E for details)." All current and wind data within the spatial domain (3D currents, and 2D winds) were acquired and kept at their native spatial and temporal resolution. It is important to note that unique wind and current data were used for each point in space [lat., long.] throughout the model domain, at each timestep (15 minutes) over the course of each model run (160 days) for the stochastic simulations that spanned the 7-year modelled time frame (2006-2012).

IR-267 **DFO-156**	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Appendix E
Context/Rationale	The modelling exercise carried out for the deep water blowout scenarios at Bay du Nord in Appendix E of the EIS do not report the output of the OILMAPDeep models nor do they consider the potential for hydrocarbons to remain trapped at depth as was observed for the DWH blowout (10-20%, Spaulding et al. 2017). In addition, the SIMAP model continues to predict that only very small fractions (< 0.01%) of oil would affect the benthos after a blowout. . Not taking into account this component and the full output of the OILMAPDeep model, may underestimate the potential effect of a blowout on the benthic environment, particularly in locations with sensitive benthic species. SIMAP requires the user to input the water column concentration of suspended sediment in order to calculate the potential for flocculation of oil in the water column. The data used to parameterize this term for the Core Bay du Nord Area are not provided in Appendix E.	
Request 15-Apr-19	A. In Appendix E, provide results from OILMAPDeep validation exercises (Spaulding et al. 2017). B. Update the assessment of potential effects of the deposition of oil on the benthos (e.g., sensitive species).	

	C. Provide data used to calculate potential for flocculation of oil in the water column.
Equinor Response 15-Nov-19	A. Refer to Appendix E, Table 3-5 for OILMAP Deep results, depicting droplet size distribution (provided as median droplet size in each of seven equal-mass bins by diameter in µm). Refer to EIS Appendix E - Appendix A: SIMAP and OILMAPDeep Model Descriptions Section 2 for a write-up of the OILMAPDeep model. The droplet size distribution and soluble fraction that will dissolve as droplets rise through the water column are considered in the SIMAP and OILMAPDeep model. The Spaulding et al. 2017 reference is well placed, as this author was the primary developer of the OILMAPDeep model. For information, additional references regarding the validation of the OILMAPDeep model and its use specifically in Deepwater Horizon are provided below. Updates to the EIS are not required. B. The effects of hydrocarbons on benthic organisms is provided in Section 16.7.4.3. This includes discussion of the mechanisms that may drive hydrocarbons to the seafloor and effects on sensitive species including corals and sponges. In addition, as stated in response to IR-66/DFO-50 additional information regarding effects to benthic invertebrates, with reference to the DWH spill, will be added to Section 16.7.4.3 of the EIS. C. A suspended concentration of 10 mg/L (conservatively high for offshore environments) was used in the model and did allow for a small amount of the release (<0.01% of the total release) to settle to the bottom within the 160-day time span for the unmitigated release scenario. This sediment concentration is not analogous to flocculation (oil agglomerates or the formation of marine-oil-snow [MOS]). But rather, the interaction of suspended sediments and oil. As stated in IR-265/ DFO-128, the SIMAP model is a state-of-the-art oil trajectory, fate, and effects model that is constantly being developed based upon the growing body of field and laboratory data associated with releases of oil in many different environments. The model has been validated against many real-world releases including the Deepwater Horizon oil spill, where it was used in the US Government's Natural Resource Damage Assessment. In this specific example, a small portion of the released oil may have sunk as a result of the interaction of released oil with sediments, drilling muds, and other material used in response efforts such as the "topkill" and "junk shot". These are currently areas of active research. While there are additional fates processes that may result slight differences in the ultimate fate of oil, these processes are known to have relatively lower effects on the total volume of oil in each environmental compartment (on the order of single percentages different, depending on the release and receiving environment) as compared to the fates processes such as entrainment, which are already being modelled. The science and algorithms that may be used to model these processes have not been developed in the scientific community to the point of a consensus or use in modelling. Ongoing research topics include the formation of MOS, photo-degradation, droplet size distributions, and many other research areas. Updates to the EIS are not required. References for Part A: French McCay, D.P, K. Jayko, Z. Li, M. Horn, Y. Kim, T. Isaji, D. Crowley, M. Spaulding, L. Decker, C. Turner, S. Zamorski, J. Fontenault, R. Shmookler, and J.J. Rowe. 2015. Technical Reports for Deepwater Horizon Water Column Injury Assessment – WC_TR14:

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IR-268	**Guideline Ref:** Part 2, Section 7.6.1	**EIS Ref:** Appendix F
DFO-130		
Context/Rationale	For the statements in Appendix F in the EIS “Each simulation covered a minimum period of approximately 6 hours to allow ample time for dispersion and settling.” (Page 3) and “Based off the depth and settling velocities of the muds, 6 hours is sufficient to allow for all particles to reach the seabed” (Page 21), a timeframe of 6 hours seems very short for the sedimentation of finer particles. For example, Figure 3-10 suggests possible settling velocities smaller than 0.05m/s. This leads to about 1000 metres settling vertical distance in six hours (Table 3-2 even reports settling velocities of about 600 metres in 24 hours). Total depth is more than this in the deeper parts of Flemish Pass. Table 3-1 in Appendix F of the EIS provides cuttings fall velocity, but the release being modelled is not clear.	
Request **15-Apr-19**	A. Provide a reference to support the six hour timeframe in Appendix F of the EIS. B. Describe the release modelled (i.e., synthetic based mud (SBM) or SBM with cuttings) in Appendix F of the EIS.	
Equinor Response **15-Nov-19**	A. Referring to EIS Appendix F, Table 2-2, the surface tank release modeled was a wide, low-speed jet 5 m below surface. The wide orifice, low-speed jet simulation settling rates used (Table 3-1) include larger size classes which settle much faster than the finer narrow orifice high-speed jet simulations (Table 3-2). Slowest settling velocities were 8,899.2 m/day (approximately 0.1 m/s) for the wide orifice, low-speed jet simulations at the surface. Thus, 6 hours should be sufficient to capture complete settling (potential settling of 2,160 m based upon settling rate, in a water depth of 1,200 m). The other modelled releases including finer grained sediments were 20 m above seafloor. B. Refer to EIS Appendix F, Table 2-2 for the modelled simulations, the modelled surface tank release that corresponds with EIS Appendix F, Table 3-1 settling velocities is a full tank release that includes synthetic based mud droplets (i.e., cuttings and muds). Settling and deposition of these droplets are reported. Water column concentrations are provided in section EIS Appendix F, Section. 4.2.	

IR-269 **CEAA-106**	**Guideline Ref:** Part 1, Section 2.3	**EIS Ref:** Appendix G_IG Workshop
Context/Rationale	Equinor provided a summary of the questions and answers to the questions raised during the Indigenous offshore workshop, October 2018, which is attached as Appendix G to the EIS.	
Request **15-Apr-19**	A. Describe how comments and questions raised during the October 2018 Indigenous workshop, in Appendix G of the EIS were addressed. B. Provide a summary table with the relevant sections of the EIS and responses of how the issues/comments were addressed.	
Equinor Response **15-Nov-19**	A. See response to IR-30/CEAA-109. The comments and questions raised by Indigenous groups that participated in any of the three Workshops held in October 2018 were categorized by reference to EIS VCs. Subsequent to the workshops, all groups, whether participants at the workshop or not, were provided with the opportunity to comment on proposed mitigation measures. Comments provided by the various groups together with Equinor's responses were set out in the Final Workshop Report (both English and French), a copy of which was provided to the Agency and to each Indigenous group listed in the EIS Guidelines. Equinor Canada reviewed the various comments and where appropriate referenced these in the relevant VC chapters, including in the section of each VC chapter respecting the identification of Potential Project-related Environmental Changes and Effects. B. A summary table listing issues and concerns raised by Indigenous groups at the workshops together with Equinor Canada's responses and relevant sections of the EIS has been prepared and is attached as Appendix A to this Response Document. A detailed description of Indigenous comments and Equinor Canada's responses is set out in the Final Workshop Report (see Appendix A to this Response Document).	

IR-270 **CEAA-107**	**Guideline Ref:** Part 1, Section 2.3	**EIS Ref:** Appendix H_IK Desktop Study
Context/Rationale	The EIS guidelines (Section 2.3) state Equinor is expected to make reasonable efforts to integrate Indigenous knowledge into the assessment. Further, Equinor's Table of Concordance (4.2.2) states "The EIS will explain what Indigenous knowledge was obtained (unless confidential), how it was obtained and will clearly show how and where Indigenous knowledge has been integrated into the EIS. An Indigenous Knowledge Study was included as Appendix H of the EIS and its Table of Concordance Equinor makes references to Section 3; Section 4; and Section 7.3. However, it is not clear to the Agency how Equinor has incorporated this Indigenous Knowledge into the assessment and the EA process.	
Request **15-Apr-19**	Explain how Equinor incorporated the Indigenous Knowledge from the Indigenous Knowledge Study included as Appendix H into the effects assessment.	
Equinor Response **15-Nov-19**	The Indigenous Knowledge Desktop Study is referenced as appropriate throughout the EIS. As required by the EIS Guidelines, Equinor has made reasonable efforts to integrate information contained in the Study into the development of the environmental baseline (e.g. Chapters 6 and 7) and into the effects assessment of relevant VCs (e.g. Chapter 9, 10, 11). Specifically, information contained in the Study, together with other sources of Indigenous knowledge (including any Indigenous knowledge provided during regular engagement	

	activities), was used by Equinor to identify those marine associated species (fish, marine mammals, seabirds) of importance to various Indigenous groups for traditional or communal-commercial harvesting or cultural purposes. This information has been incorporated into Tables 7.9 to 7.16 (baseline information relating to Indigenous groups), Tables 7.17 and 7.18 (species harvested pursuant to communal-commercial licences) and Table 7.19 (marine associated species of traditional importance). Indigenous knowledge was taken into account in the development of the ecosystem approach to effects assessment. More particularly, the Study contributed to the selection of marine associated species for assessment purposes. For example, Indigenous groups identified particular species of traditional, cultural or commercial significance with potential to occur in the Project Area (e.g. Atlantic salmon, American eel, North Atlantic right whale) which then were included in the relevant VC chapter. Indigenous knowledge contained in the Study was also used to inform the identification of potential impacts upon resource use in the event of an accident or malfunction (e.g. potential direct effects upon communal-commercial fisheries, potential indirect effects upon human health) as discussed in Chapter 16. Updates to the EIS are not required.

IR-271 **C-NLOPB-13**	**Guideline Ref:** Part 2, Section 3.1, Section 7.3	**EIS Ref:** Appendix I
Context/Rationale	Appendix I of the EIS shows the release point for cuttings in a NAFO special area about 13 km from the proposed production installation. Being in the Flemish Pass, oceanographic conditions change, in particular currents and water depth, across the Flemish Pass, which will affect the dispersion of cuttings. Because of the location and distance from the production installation, the cuttings release point is not considered to be representative of effects of cuttings discharge from drilling activities near the production installation.	
Request **15-Apr-19**	Discuss differences or similarities in oceanographic conditions (i.e. current and water depths) at the drilling locations near the production installation and the location modelled, which is 13 km away; and whether and how any differences would affect the dispersion pattern.	
Equinor Response **15-Nov-19**	Oceanographic conditions are similar across the Core BdN Development Area, including proposed template locations near the FPSO, south of the FPSO and at the location modelled. As stated in the EIS (Sections 2.4, 2.6.3.1, and Figure 1-1 Appendix I) water depths in the Core BdN Development Area range from approximately 1,000 to 1,200 m, rising slightly on the lower slopes of the Flemish Cap at the very eastern edge of the Core BdN Development Area. At modelled location the depth is 1,170 m; and at CM-2, the source of input currents, the depth is 1,120 m. The CM-2 location is approximately 6.5 km from the Project location. Therefore, oceanographic conditions are similar across the Core BdN Development Area and the modelling location is a representative site for the entire Core BdN Development Area. Ocean currents are expected to be comparable across the Core BdN Development Area, including the modelling location. This is evident in the Figures 3-10 to 3-13 (winter and summer surface and 1,000 m currents) in Section 3.3.1, Appendix I. Here, current directions over the Core BdN Development Area (about five east-west cells each of size 0.1°) are shown to be similar, to the southeast or south. Current speeds are small and consistent between these two locations as well, in the range 4 to 12 cm/s. The input	

	current measurements from CM-2 used in the modelling compare favourably with gridded modelled currents (Appendix I, Section 3.3.1) and are therefore representative of what would be encountered. For clarity, the following text will be added to Section 4.3.4.1 of the EIS. "The modelling location (at 1,170 m) is representative of water depths within the Core BdN Development Area, which range from approximately 1,000 m to 1,200 m. ***Ocean currents, both speed and direction, are expected to be comparable over this region (see Section 3.3, Appendix I for details). Therefore, conditions at the modelling site are representative for all drilling locations in the Core BdN Development Area.*** *"*

IR-272	**Guideline Ref:** Part 2, Section 7.3.1, Section 7.3.3, Section 7.3.4	**EIS Ref:** Appendix I
DFO-131		
Context/Rationale	In Appendix I of the EIS, the advection-diffusion of a distribution of particle approach used in Appendix F of the EIS should also be used here. Particle Size Distribution is not defined (Page 4, Executive Summary). In Appendix I of the EIS, there is no explanation on how using simulations from other sites in the world is relevant in this case. The total depth is a major factor for settling distance (Page 4, Executive Summary). For the statement *"*While the two base case simulations estimate about 3 to 5.8 percent material settling at the wellsite, the two Troll A Platform PSD simulations result in much greater material at the wellhead, on the order of 27 to 34 percent with the Nedwed simulation yielding a similar 32 percent*"* (Page 5, Executive Summary), given such as difference, the purpose of showing results from the North Sea is unclear. Regarding the statement *"*Ocean currents were characterized for the model with measurements available from… an Equinor Canada met-ocean monitoring program from **July 2014 to May 2016 in the northern Flemish Pass in a water depth of 1,120 m… assumed to be representative over the 16 km x 16 km model grid centered in the Core BdN Development Area.*"*** (Page 4, Executive Summary), it should be noted that currents are highly variable over short distances in the area (see for example Figure 5-34 in Chapter 5 or Figure 3-3 in Appendix F or Figure 3-10 in Appendix I of the EIS). Currents may not be representative of a whole grid cell. Regarding the statement, "For the two Bay du Nord base case simulations, just less than two thirds of the cuttings material settles within the 16 kilometre model grid domain, most of this within two kilometres. The remaining unsettled material includes the finer silts and clays with settling times of about two weeks or longer at a distance of almost 60 km or more (especially for the clays in the no flocculation input); these results are for a horizontal current input of 5 cm/s.*"* (Page 5, Executive Summary), it is not clear why velocities from a single point in space were utilized. It is unclear how the conclusion in *"*Considering **all five simulations,** median (most likely) cuttings thicknesses are predicted to range from about 170 to 1,900 milimetres at the wellsite to 9 to 25 milimetres out to 100 metres*"* (Page 5, Executive Summary) is supported as there are only two simulations that are relevant for this project simulations from BdN are those with much less retention of the cuttings near the drilling site (thus a larger area is impacted with likely a thinner layer). The algorithm (Page 14) is by definition unable to follow a particle cloud with both time and space varying currents.	

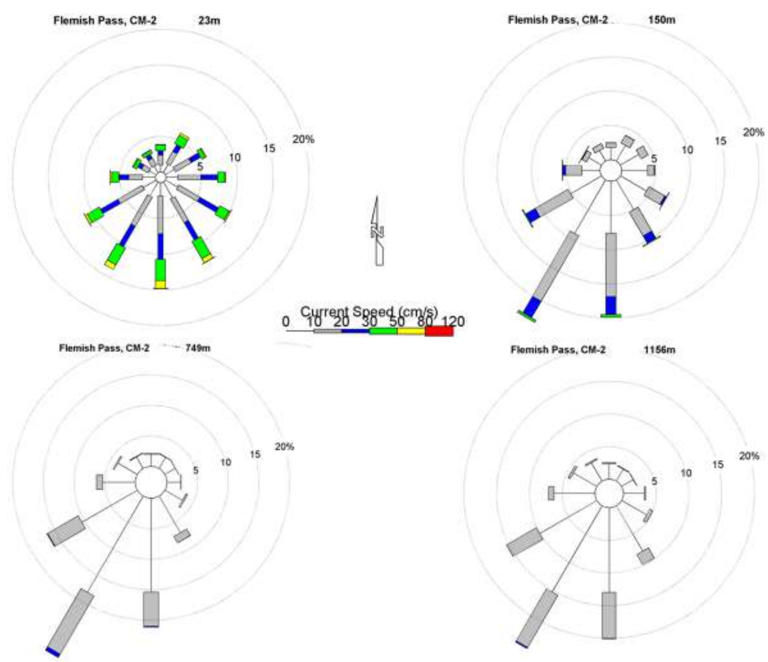
	There are two issues regarding. DFO is of the view that "ocean currents are assembled based on nearest available measurements, from the CM-2 current mooring measurements, and are assumed representative of conditions at and near the drilling location." (Page 18) Currents from a location different to the particle positions are used. Currents from the same fixed station are used when particles move. Currents vary in time and space, thus the need for time-varying and space-varying current input. This assumption may hold on very small distances, but it is stipulated that some cuttings travelled as far as 60 kilometres (Page 5). This is especially true for the fine fraction (silts and clays which are by far the largest fraction in the release; see Table 3-6) that remains in the water column for a longer period. Given existing numerical tools, an approach such as in Appendix F should be used. Table 3-2 (Page 20) includes a *"washout factor"* of 10-20% for WBM. The purpose of the washout factor is unclear. *"A seven year (2006 to 2012) record of HYCOM daily current hindcasts was obtained for a location at 47.9432°N, 46.4336°W, 11 kilometre southwest of CM-2 and 16.7 kilometre west of the drill cuttings modelling location."* (Page 41). Since available, 3D HYCOM currents (time and space varying) should have been used initially for the simulations. For BdN (scenario of interest here), 37% of the material is not settled during the simulations (Page 58). Each well is assumed to create between 2.3 and 2.6 x 10^3 tonnes of cuttings. If one third of this amount is dispersed beyond the model domain this would represent 30 to 35 x 10^3 tonnes of cuttings for the proposed 40 wells of the project. Further development and other exploratory wells would also contribute to this unaccounted for material. Consequences of this large volume of sediment should be explored. For the statement "All eight of the individual deterministic model run outputs that were input to the stochastic analysis" (Page 74), eight simulations is a very low number for stochastic analysis. In addition, the differences between the eight runs (called eight wells in the Section title) are not specified. The model includes one scenario with flocculation of fines, but does not include disaggregation or resuspension processes. Although bottom currents are low in the deep waters of this part of the Flemish Pass, they are variable and resuspension will have an effect on the eventual distribution of the finer particles. This approach downplays potential effects of smothering and it is unclear how it might affect the size of the zone influence. The proponent indicates that a cuttings dispersal system may be used to move the cuttings away from the well head and to disperse the pile. This is argued to reduce the overall effect of the cuttings since the height of the pile will be reduced. The question of the potential for such a system to spread out the zone of influence farther from the drilling site is not addressed.
Request 15-Apr-19	A. Utilize advection-diffusion of a distribution of particle approach used in Appendix F of the EIS for simulations in Appendix I of the EIS. B. Describe particle size distributions. C. Explain how the depth at other sites compare to the Bay du Nord situation. Provide rationale of showing results from other sites in the North Sea. D. Explain why HYCOM currents in Appendix I of the EIS was not used in Appendices E and F of the EIS E. Justify why velocities from a single point in space were used in Appendix I of the EIS.

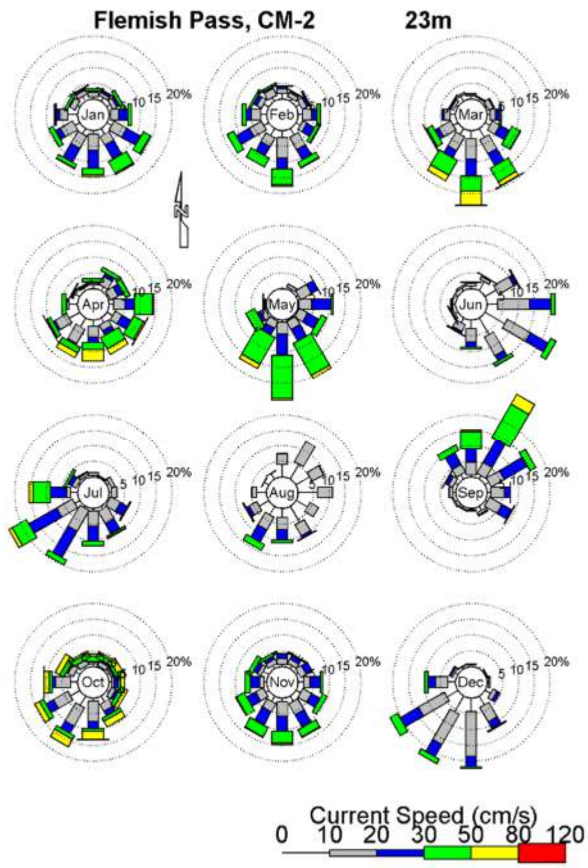
	F. Provide justification or revise numbers given in page 5 and 6 in Appendix I of the EIS to only include BdN scenarios. G. Regarding the algorithm (Page 14 in Appendix I of the EIS), explain why an updated new model such as in Appendices F or J of the EIS was not used. H. Regarding ocean currents, explain why different approaches were used in Appendix F and Appendix I of the EIS. I. Explain washout factor and how is it used in the calculation of amounts of WBM and the particle size distribution in Appendix I of the EIS. J. Describe fate, effects and cumulative effects (i.e., from multiple wells) of the fine particulates that do not settle in the modelled area in Appendix I of the EIS. K. For the stochastic analysis, describe differences between the eight runs. Justify use of low number of simulations in Appendix I of the EIS. L. Describe potential effects from disaggregation and resuspension processes, with respect to smothering and zone of influence in Appendix I of the EIS. M. Discuss the potential for such a system to actually spread out the zone of influence farther from the drilling site in Appendix I of the EIS. N. Provide additional simulations for drill cuttings dispersion to estimate their fate and the eventual distribution of the fine-particulate material not captured in the current model domain in Appendix I of the EIS or provide further information on the assumptions, limitations, etc. from the current model and how these affect the predictions of the effects assessment.
Equinor Response 15-Nov-19	A. The drill cuttings model used is an advection-diffusion model and is described in EIS Appendix I, Section 2.1. B. PSD is defined in EIS Appendix I, page 4 "…A variety of cuttings particle size distributions (PSD) based on …" PSD are described in EIS Appendix I, Section 3.2 C. All simulations in the model are for the model location in the BdN Project Area. There are no simulations undertaken for other sites internationally. Input cuttings characterization data using international data are employed to provide additional information to reduce uncertainty that is inherent in modelling. In particular, considering PSD data are rare, it was appropriate to consider additional PSD data from international studies, such as those described in the modelling report (i.e., Trolla (Norwegian continental shelf with cuttings from two top hole sections) and Nedwed (Lower Cook Inlet, Alaska) with cuttings from a 2,500 m hole depth). D. It is important to note, as presented in Section 3.3.1, Appendix I of the EIS, comparisons between HYCOM and the CM-2 currents used illustrate that while there are some interannual variability in the speeds, as would be expected, the one-year CM-2 record, besides being measurements (compared with hindcasts) provide, by virtue of comparable annual monthly mean, maximum, and standard deviation values, a realistic representation of currents which might be expected at Bay du Nord. The assumption for currents being fairly uniform (both in magnitude and direction) over the 16 km x 16 km modelled domain (where 16 km is the approximate distance east from the modelling location Site 1 to the Project Area boundary) is verified in the figures in Section 3.3.1, Appendix I. The cuttings material footprint predictions are within approximately 1 km for any thicknesses greater than 1 to 2 mm (Section 5.2.1 figures). In this instance (distance scale) the assumption of uniform currents is valid. At greater distances, certainly

	beyond the 16 km model grid boundary, it is predicted that the materials (particularly the SBM cuttings released near-surface) will be widely dispersed. At these distances due to the random, turbulent diffusion of the small particles (Appendix I, Section 2.1) with time (i.e., approximately two weeks before settling to the seabed and travelling distances greater than 16 km), these amounts would translate into thicknesses that are well below the PNET. E. See response to IR-271/C-NLOPB-3. F. The scenarios modelled for drill cuttings dispersion are for the BdN Project. Two simulations (scenarios) used 'local' BdN inputs: the other three simulations used other input data and were selected to reduce some of the inherent uncertainty in the input PSD (see response to Part C, above). Updates to the EIS are not required. G. The advection-diffusion algorithm is able to track particles in time with corresponding currents. Spatially-varying currents could be configured; however, as discussed in Part D, it is not warranted. H. As discussed in Part D, it is the cuttings footprint near the wellsite (due to its thickness, e.g., PNET treatment) that is of most relevance. The thicknesses fall below PNET of interest well within 1 km. I. The washout factor is an allowance for potential increased cuttings volume. Washout is an enlarged area of the wellbore caused by removal of formation grains during drilling or circulation [Petrowiki] or enlarged region of the wellbore [Schlumberger oilfield glossary]. J. All cuttings materials are tracked within the modelled area until they reach (a) the seabed or (b) the model grid boundary. In the case of the model grid boundary, a review of all amounts of material at any of the boundary grid locations (x, y, depth) for the eight well simulation indicates all material amounts are such that, even if they settled at the boundary, the deposition would be at thicknesses less than 0.1 mm (i.e., well below the PNET values used in the EIS). Therefore, the fate and effects of fine particulates that do not settle within the model gird area will be negligible. K. Illustration of the differences between the eight simulations is provided with the eight footprint figures in Section 5.2.1 of Appendix I of the EIS, and the cross-sections of P25, median, P75, P95 and maximum thickness in EIS as shown in Section 5.2.2 of Appendix I. These statistics don't explicitly compare the eight simulations, rather as per the stochastic intent, indicate the range of thickness predictions from the eight simulations. With the longer drilling program duration on the order of 395 days for the eight well model simulation, a total of eight deterministic simulations was chosen, with each start date 45 days apart in the calendar year. In this way the annual variation in currents is incorporated. The primary footprint, at a high probability level of 85%, confined to about the 200 m distance – and due to the larger cuttings particles - is unlikely to change from any new or different input currents with running of additional simulations, on top of the eight. Illustration of the differences in results between the eight simulations is provided with the eight footprint figures in Section 5.2.1 of Appendix I of the EIS. However, it is the contribution each run makes to the overall grid - effectively eight grids superimposed on each other – that is relevant. By examining the thicknesses that the collection of eight runs predict for a given model cell location, in this 'composite grid', probabilities of thicknesses and probabilities for the PNET thresholds of interest are then tabulated – as described in Section 2.2.

	The model predictions provide an estimated zone of influence on which the environmental assessment is based. With regards to Fish and Fish Habitat, as discussed in Section 9.2.3.2, it is the estimated distances to which total cuttings thicknesses fall below the PNETs of 6.5 mm and 1.5 mm which define the zone of influence for the Marine Fish and Fish Habitat VC. The potential interactions in this zone of fluence, which is approximately 200 m, are assessed. The 200 m estimate is based on the maximum (of the distribution of thicknesses resulting from considering all eight runs as they input to the overall grid) and is a likely maximum extent. As noted in the EIS and clarified in response to IR-146/Conformity ECCC-4;ECCC-25, a follow-up L. The implications of not modelling processes at the benthic boundary layer can result in over-prediction of benthic impacts (IOGP 2016) and so using the PNET values as a guide to areas potentially affected is likely conservative. This means that in practice the subsequent resuspension and further transport of cuttings due to post-depositional processes would likely make the deposited thicknesses smaller. See also response to IR-274/CEAA-26. M. For information on the Cuttings Treatment System (CTS), see responses to IR-97/DFO-78 and IR-102/CEAA-33. N. As stated in response to IR-35/CEAA-2, the purpose of modelling in environmental assessment is to provide a predication of an estimated zone of influence, or area where impacts may occur, on which the environmental assessment is based. Equinor Canada is conservative in its estimates of potential zone of influence in the EIS from drill cuttings modelling. As indicated in IR-208/DFO-102, it is predicted that there would be an estimated 0.5 km² potential zone of influence associated with a drilling template and cuttings dispersion, which assumes conservatively, that drill cuttings would be discharged approximately 150 m away from the template location. If one were to only use the 200 m ZOI for drill cuttings, the estimated potential zone of influence would be approximately 0.13 km². Assumptions of the model are presented in Section 2.3 of Appendix I. As noted in IR-274/CEAA-26, the potential effects from the cuttings release are primarily localized to the cuttings pile and are mainly associated with the smothering or burial from discharge of the pile itself. The effects assessment on drill cuttings remains valid. Furthermore, as stated in the EIS and clarified response to IR-146/Conformity ECCC-4;ECCC-25, an environmental effects monitoring program will be implemented for the BdN Development Project, with one of the objectives to “verify the predictions of environmental effects contained within the EIS”. No additional simulations are required. As stated above, the fine particulate matter drifting outside the model domain would be widely dispersed and settle at thicknesses less than the PNET values used in the EIS. The drill cuttings dispersion model employed for the BdN Development Project EIS is the same model used in environmental assessments for previously approve offshore oil and gas projects (Hebron Project EIS (ExxonMobil 2011); Flemish Pass Drilling EIS (Statoil 2017); Eastern Newfoundland Offshore Exploration Drilling Project (ExxonMobil 2017). The above responses address the information requests submitted by regulatory authorities during the review of the BdN EIS. During the Regulatory Workshop (May 2019), Equinor Canada committed to providing information on the following items. • <u>Information from SERPENT monitoring programs</u>. The SERPENT project collaborates with the oil and gas industry and primarily employs ROV technology to study and monitor the marine environment (http://www.serpentproject.com/about) during offshore oil and gas activities and has

	been described in various publications (e.g., Jones et al. 2012, Gates and Jones 2012, Gates et al. 2017). One of the study areas for SERPENT includes routine operations and drill mud and cuttings discharges. The effects of top wellhole section drilling on benthic habitats appear to be on a scale of tens to hundreds of metres with reduced heterogeneity observed at close proximity to the wellsite due to sediment being smothered by drill cuttings and drilling mud (Gates et al. 2017). The Laggan deep-sea drilling site (600 m) in Faroe-Shetland Channel produced cuttings depositional areas distributed within 250 m from the source with a maximum thickness of 1.5 m (Jones et al. 2012; Gates et al. 2017). At the Morvin site (114 m water depth) in the Norwegian Sea vertical accumulations of sediment to 400 mm were observed at 10 m from the wellsite, with height reduced with distance from the well (Gates and Jones 2012; Gates et al. 2017). Measures of barium (a tracer for deposited barite, a densifying additive to drill muds) taken at two sites in the North and Norwegian Seas (Ragnarokk (114 m depth) and Morvin) indicate high concentrations close to the well (about 10 m) that are about 36 to 150 times larger than pre-drilling values, while values at 100 m are about 1.5 times larger than pre-drilling (Gates et al. 2017). A reduction in particle size on the cuttings piles compared with before drilling was observed at the two locations. At Ragnarokk the percentage of fines (diameter <0.63 mm or coarse silt size) increased from six percent before drilling and at 100 m to 50 to 55 percent at 10 and 25 m after drilling (Gates et al. 2017). At Morvin, the percentage of fines was increased from 38 to 53 percent before drilling to 80 percent at 10 m from the well after drilling (Gates et al 2017). These findings indicate that that cuttings deposition is within 100s of m of the wellsite. While somewhat shallower water depths, these findings from the Serpent studies are consistent with the predictions of drill cuttings deposition for the BdN Project. Furthermore, as stated in the EIS and in response to IR-146/Conformity ECCC-4;ECCC-25, one of the primary objective of the BdN EEM program will be to validate EIS predictions. • <u>Effects on benthic communities from the deposition of drill cuttings</u> Effects on benthic communities from the deposition of drill cuttings is addressed in Section 9.2.3.2, with clarification provided in response to IR-128/DFO-20/CEAA-61. References: ***Brandsma, M.G. and J.P. Smith. 1999. Offshore Operators Committee Mud and Produced Water Discharge Model – Report and User Guide. Production Operations Division, EPR.29.PR.99, ExxonMobil, Houston, TX.*** ***Gates, A.R., Benfield, M.C., Booth, D.J., Fowler, A.M., Skropeta, D., and Jones, D.O. 2017. Deep-sea observations at hydrocarbon drilling locations: Contributions from the SERPENT Project after 120 field visits. Deep Sea Research Part II: Topical Studies in Oceanography, 137, 463-479.*** IOGP (International Association of Oil and Gas Producers) 2016. Environmental fates and effects of ocean discharge of drill cuttings and associated drilling fluids from offshore oil and gas operations. Report 543.)

IR-273 DFO-132	**Guideline Ref:** Part 2, Section 7.3.1, Section 7.3.3, Section 7.3.4	**EIS Ref:** Appendix I; Appendix J
Context/Rationale	Given that models in Appendices I and J of the EIS use the same forcing, it remains unclear how the modelled cloud can have such different behaviour (mostly southward flow for drill cuttings and eastward flow in many occasions for produced water).	
Request 15-Apr-19	Provide the rationale on the different behavior of the modelled cloud for drill cuttings and produced water.	
Equinor Response 15-Nov-19	The different behaviour of the modelled 'clouds' is primarily related to the difference in the time of year used in the modelling. The produced water model considers June, while the drill cuttings model considers a full year. For instance, at near-surface at 25 m, (depth of produced water release = 20 m) the current in June is predominantly to the ESE (from the CM-2 mooring). However, at 25 m for the entire year, the current is predominantly to the south. The produced water model considers depths down to 100 m. Conversely, the drill cuttings model considers depths down to the seafloor, approximately 1,100 m. Note as well, drill cuttings releases are at the seabed and from near-surface. For these reasons alone – different times of year, different depths involved - a strict comparison of the two behaviours is not possible. The following illustrations of water currents from Appendix I supports the above information.  **Appendix I Figure 3-5: Annual Current Roses, CM-2 Northern Flemish Pass, 23, 150, 794, 1,156 m** Note: 23 m depth bin is a composite of three CM-2 deployments with bins at 25, 24, and 22 m. Similarly, the other depths would comprise slightly different depths 'at the noted depth' due to the actual depth the ADCP sits for its particular deployment 1 through 3. The currents are from ADCP depth bins, not a single point CM, so while currents are 'from discrete depths' they are assumed representative, and applied uniformly, over an associated depth range in the modelling.	



Appendix I, Figure 3-6: Monthly Current Roses, CM-2 Northern Flemish Pass, 23 m

Updates to the EIS or Appendix I are not required.

IR-274 **CEAA-26**	**Guideline Ref:** Part 2, Section 3.1	**EIS Ref:** Appendix I, Section 5.2.3
Context/Rationale	In Appendix I of the EIS, the statement is made that slumping of the larger cuttings piles near the wellsite will occur resulting in smaller thicknesses. However, there is no discussion of how the slumping would enlarge the footprint of the pile, or the fate of slumped materials (such as potential increased thickness in adjacent areas, or altered grain size distribution). Benthic boundary layer processes are not described to influence weathering of cuttings piles. Seabed transport mechanisms at the wellsite areas to induce winnowing effects to reduce cutting pile height were not described. The fate of drill wastes is required to be assessed as per Section 3.1 of the EIS Guidelines.	
Request **15-Apr-19**	A. Describe the mechanisms of sediment transport in the Core BdN Development Area. B. To support the statement on recovery of seafloor sediment (as per Section 4.3.3 Reversibility definition) describe how grain size distribution would be altered in the affected areas in the Core BdN Development Area. C. Update the analysis for effects of drill waste on the benthic environment as applicable.	

Equinor Response 15-Nov-19	The slumping of the cuttings pile at the wellsite will enlarge the footprint of the pile slightly. Considering a thickness of 1.5 mm, the initial deposit from drilling eight wells concentrated at the wellsite remains above this threshold to distances of 180 to 200 m from the drill centre. The cuttings pile that settles will tend to slump to an angle of repose, or friction angle (see Table 1 below from Ortiz et al. 1986), depending on the material composition. An angle of repose of 20° to 30° where slumping may occur may be anticipated for the base case (with flocculation) from the Bay du Nord field cuttings materials of very fine sand, and mostly silts and clays. A slumping estimation was applied to the initial pile from one of the eight-well simulations assuming an angle of repose of 25°. The slumping is simulated by stepping through each model output grid cell comparing each cell to each of its eight neighbouring cells. If the angle of repose between the primary cell and the neighbouring cell under consideration is greater than a prescribed angle of repose, a very small portion of the material in the primary cell is reallocated to that neighbouring cell. This is iteratively repeated for all cells until no more angles of repose between neighbouring cells are exceeded. The slumping would redistribute the material over the immediate vicinity about the well – now at more uniform thicknesses of about 150 mm or less – and slightly enlarge the footprint (at a 1.5 mm thickness limit) out to about 220 to 240 m for select bearings from the wellsite. This is consistent with the predicted footprint of approximately 200 m around the wellsite determined as the limit for smothering effects on benthic species, as assessed in Section 9.2.3.2 of the EIS. During the period of drilling the maximum eight wells at a single template (greater than one year), the dispersed materials that settle will be worked into the sandy mud (EIS Section 5.1.2, Figure 5-3). Coarser sand materials that have settled will likely remain, while the finer particles are more susceptible to being selectively resuspended and transported with the low (annual bottom mean speeds of 7 cm/s) currents before resettling. The Bay du Nord cuttings material is over 90 percent silts and clays (EIS Appendix I, Section 3.2, Table 3-6). This is similar to the muddy seafloor environment and, also given the material will be widely dispersed over the region at thicknesses <0.1 mm outside the wellsite footprint (approximately 200 m), therefore unlikely to alter the sediment grain size distribution on the seabed. As the distribution of cuttings piles are likely to be localized (approximately 200 m) with estimated slumping and low currents, the potential effects on the environment remain localized. As indicated in Appendix I, fine sediments outside of the footprint are predicted to be below threshold thicknesses, patchy in nature, with limited accumulation. As described in Section 9.2.3.2, synthetic-based mud and water-based mud cuttings are low toxicity and SBM components in cuttings degrade quickly. Potential effects are localized to drill cuttings piles and are primarily associated with smothering or burial from discharge of the cuttings. The effects assessment on drill cuttings remains valid. The information in the EIS is complete and amendments are not required. Table 1 - Selected Strength Properties for Soils

	Cohesion (kPa)	Friction Angle Peak (degrees)	Friction Angle Residual (degrees)
Gravel	--	34	32
Sandy gravel with few fines	--	35	32
Sandy gravel with silty or clayey fines	1.0	35	32
Mixture of gravel and sand with fines	3.0	28	22

	Uniform sand - fine	--	32	30
	Uniform sand – coarse	--	34	30
	Well-graded sand	--	33	32
	Low-plasticity silt	2.0	28	25
	Medium- to high-plasticity silt	3.0	25	22
	Low-plasticity clay	6.0	24	20
	Medium-plasticity clay	8.0	20	10
	High-plasticity clay	10.0	17	6
	Organic silt or clay	7.0	20	15

Source: adapted from Ortiz et al. 1986

References:

Ortiz, J.M.R., J. Serra, and C. Oteo, 1986. Curso Aplicado de Cimentaciones. Third ed. Colegio de Arquitectos de Madrid. Madrid.

IR-275 **ECCC-44**	**Guideline Ref:** Part 2, Section 7.2	**EIS Ref:** Appendix J, Section 2, Table 2.1
Context/ Rationale	Appendix J, Section 2 of the EIS, is not clear about the volume of produced water that should be considered as a worst-case scenario Produced water modelling used a produced water flow of 30, 000 m³/day (Table 2-1) yet Section 2.7.1.5 of the EIS states that produced water discharge rates associated with the Project are estimated to range from 30,000 m³/day to 50,000 m³/day. Section 9.1.4 of the EIS states that the modelling approach was conservative and provided worst-case results. Intuitively it would seem that using the higher flow rate in the model inputs would represent a worse - case scenario than using the lower discharge rate.	
Request **15-Apr-19**	Explain the selection of the produced water flow rate of 30,000 m³/day as opposed to 50,000 m³/day, and why it would provide worst-case results.	
Equinor Response **15-Nov-19**	In order to address the discrepancy that a discharge of 30,000 m³/day of produced water was not the worst-case scenario, additional scenarios, using 50,000 m³/day, with and without dilution with cooling water were modelled. The updated produced water modelling report is appended to this response document (see Appendix I) The assessment of potential effects on the relevant VCs associated with produced water discharge will be revised to reflect a discharge of 50,000 m³/d. The following sections of the EIS will be amended to include amended produced water modelling results. <u>Section 4.3.4.2.</u> Note, revised Table 4.7 can be found in Appendix J to this Response Document. "Produced water release modeling was conducted by Elisabeth Deblois Inc. to examine the distribution of produced water discharge from the FPSO location (Section 2.7.1.5) (full report in Appendix J. The produced water modeling exercise used the Dose Related Risk and Effects Assessment Model (DREAM). DREAM was developed by SINTEF in Trondheim, Norway, and is used globally to assess the distribution of produced water discharges (SINTEF 2018). ***Six***	

	scenarios for produced water release were simulated and are summarized in Table 4.7.***"*** <u>Section 9.2.2.2</u> "To provide additional Project-specific information and analysis related to the nature and extent of the produced water plume resulting from the Project, detailed produced water plume modelling using DREAM was carried out. This included modelling the potential plume extent in June, considered the most sensitive month for when biological resources are most vulnerable (DeBlois ~~2018~~ **2019** in Appendix J). The thermal plume was not assessed as part of the produced water discharge modelling as the discharge temperature and rates were much lower compared to other studies where modelled effects were estimated to be negligible (SINTEF 2014). ~~Four~~ ***Six*** scenarios for produced water release were simulated:" ***Scenarios simulated with a produced water release rate of 30,000 m³/day:*** • Case 1: 15 ppm OIW concentration, no mixing with cooling water • Case 2: 30 ppm OIW concentration, no mixing with cooling water • Case 3: 15 ppm OIW concentration, mixing with cooling water • Case 4: 30 ppm OIW concentration, mixing with cooling water ***Scenarios simulated with a produced water release rate of 50,000 m³/day:*** • ***Case 5: 30 ppm OIW concentration, no mixing with cooling water*** • ***Case 6: 30 ppm OIW concentration, mixing with cooling water*** The produced water plume for all six cases extended to the southeast or south and was generally restricted to the upper 50 m of the water column, with higher concentrations in the upper 10 m near discharge source. ~~Results within 100 m from discharge source indicated that concentrations could exceed no-effects concentrations up to 20 percent of the time for OIW, up to 40 percent of the time for 2-3 ring PAHs and phenol, and up to 60 percent of the time for BTEX. All concentrations decreased with distance. From 100 to 500 m, OIW concentrations could exceed no-effects concentrations up to 10 percent of the time. For BTEX, 2-3 ring PAHs and phenol, concentrations could exceed no-effects concentrations from approximately 5 to 20 percent of the time within 2 km from discharge source. The footprint of oil concentrations over the threshold (70.5 µg/L) for Case 1 was less than half that of Case 2. The occurrence of concentrations over the threshold (70.5 µg/L) was reduced in Case 3, relative to Case 1, primarily because of mixing of produced water with cooling water (Figure 9-3). The difference between Case 2 and Case 4 is not as apparent and it is probable that the higher plume volume caused produced water to expand over a larger area.~~ ***The footprint of oil concentrations over the threshold (70.5 µg/L) for Case 1 was less than half that of Case 2. Relative to Cases 2 and 4, Cases 5 and 6, with the influence of discharge volume of 50,000 m³/d, had an increase in the footprint of oil concentrations over the threshold. The occurrence of concentrations over the threshold (70.5 µg/L) was reduced in Case 3, relative to Case 1, primarily because of mixing of produced water with cooling water (Figure 9-3). The differences between Case 2 and Case 4, as well as, Case 5 and Case 6 respectively are not as apparent, and it is probable that the higher plume volumes caused produced water to expand over a larger area.*** With an initial dispersed oil concentration of 30 ppm, many model cells remained above the threshold (70.5 µg/L). These results varied for each constituent depending on their initial concentrations and respective thresholds; and constituents with similar concentrations between the 15 ppm and 30 ppm profiles and with low no-effects thresholds may show little change across the six cases. However, in general and as

would be expected, mixing with cooling water decreases concentrations of constituents.

Case ~~2~~ 5 represented the produced water plume with the highest discharge volume, the highest dispersed oil concentrations, and no mixing with cooling water. This case was further assessed as it had the highest potential for elevated concentrations of chemical constituents in the water. Concentrations of dispersed oil, some BTEX and 2-3 ring PAHs, and phenol occurred at concentrations above their no-effects concentration (see Section 9.1.4). For all of these, concentrations were highest within 100 m from the discharge source; higher concentrations were more common to the southeast and within the top 10 m of the water column. ~~The probability for elevated concentrations above no-effects thresholds within 2 km from the produced water source ranged from five to 20 percent. Remaining constituents had zero or near-zero probability of occurrence over no-effects threshold.~~ ***Results within 100 m from discharge source indicated that concentrations could exceed no-effects concentrations up to 40 percent of the time for OIW, up to 60 percent of the time for 2-3 ring PAHs and phenol, and up to 60 percent of the time for BTEX. All concentrations decreased with distance. From 100 to 400 m of discharge source, OIW concentrations could exceed no-effects concentrations 10 to 20 percent of the time; and from 400 m to 1 km, concentrations could exceed no-effects concentrations 5 to 10 percent of the time. For BTEX, 2-3 ring PAHs and phenol, concentrations could exceed no-effects concentrations 20 to 30 percent of the time from 100 to 400 m, 10 to 20 percent of the time from 400 m to 1 km, and 5 to 10 percent of the time from 1 to 2 km. percent. Of remaining constituents only butylphenol and C4 alkyl phenols had 5 percent probability of occurrence over no-effects threshold within 1 km from the discharge source.*** Case 5 represents the worst case of the six cases and estimates of the potential zone of influence of produced water constituents discussed here can be regarded as conservative. ~~At a 15 ppm OIW concentration (Case 1), the footprint of concentrations above threshold for OIW was less than half of that in Case 2. The footprint at 15 ppm was even further reduced in Case 3, through mixing with cooling water.~~

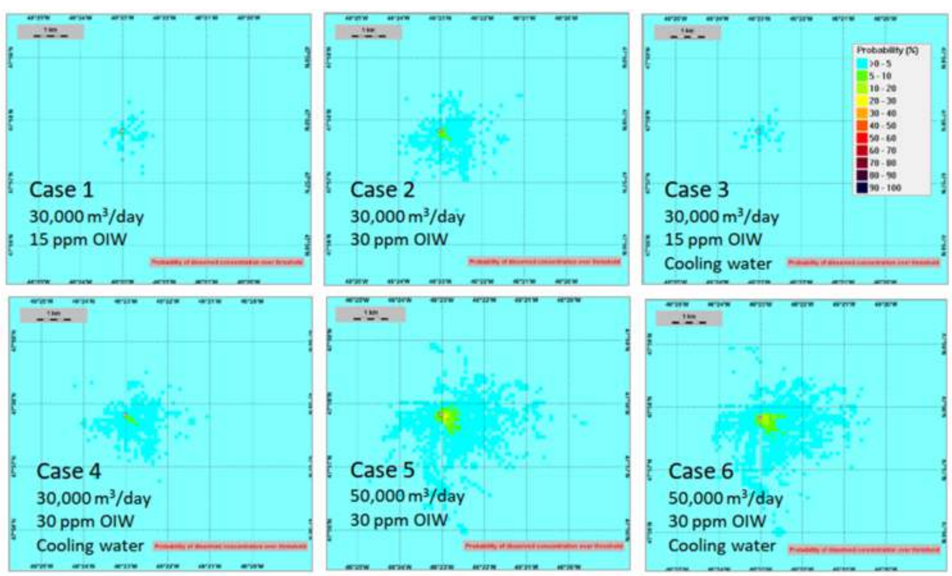


Figure 9-3 Probability that Dispersed Oil will Exceed a No-effects Concentration (PNEC) of 70.5 µg/L Based on a 30-day Simulation for 30,000 m³/day No Dilution (Case 1: 15 ppm Dispersed Oil and Case 2: 30 ppm Dispersed oil),Dilution with Cooling water (Case 3: 15 ppm Dispersed Oil and 4: 30 ppm Dispersed oil)***, and***

	simulation for 50,000 m³/day with No Dilution (Case 5: 30 ppm) and Dilution with Cooling water (Case 6: 30 ppm)" Section 10.2.2.2 See response to IR-170/CEAA-83 Part B. Section 11.2.2.2 "Based on modelling of produced water discharge scenarios undertaken for the Project (see summary in Section 9.2.2 and detailed report in DeBlois ~~2018~~ ***2019*** in Appendix J), the produced water plume was predicted to be of highest concentration ***within 100 m of the discharge source and within the upper 10 m of the water column.*** The modelling simulated ~~four~~ ***five*** produced water discharge scenarios with assumed concentrations of 15 ppm or 30 ppm dispersed oil and no dilution or dilution with cooling water." The inclusion of the updated produced water information will not result in changes to the effects assessment for the respective VCs. EIS conclusions remain valid.

IR-276	**Guideline Ref:** Part 2, Section 7.2	**EIS Ref:** Appendix J, Section 7.2; Table 2.1
ECCC-45		
Context/Rationale	In Appendix J, Section 2 of the EIS, it is not clear how the assumed salinity was estimated in the EIS The produced water release scenarios with and without the addition of cooling water used a predicted salinity of 33 ppt (Table 2-1 of the EIS). Section 2.6.2 (of the EIS) states that direct seawater cooling will be used, indicating that the cooling water should have the salinity of the seawater in the Project Area. The salinity of produced water may range from a few parts per thousand to that of a saturated brine (~ 300 ppt). Most produced waters have salinities greater than that of seawater. Section 9.2.2.2 of the EIS cites salinity measurements of Hibernia's produced water of 46 to 195 ppt. The assumed salinity is the same for all four model cases, regardless of the addition of cooling water.	
Request **15-Apr-19**	In Appendix J and Section 2 of the EIS, clarify: A. how the salinity of the produced water versus the cooling water were estimated; B. why the salinity of the assumed total flow is the same in all cases; C. why the addition of cooling water to produced water would not have an effect on the salinity of the total flow; and D. whether the use of a higher salinity in the model simulations would result in a worse - case scenario than is currently presented. E. update the effects assessment, if necessary.	
Equinor Response **15-Nov-19**	A. Equinor Canada completed a formation flow test on the Bay du Nord reservoir. Salinity was one of the parameters analysed. The values ranged from 30 to 36 ppt. B. For the modelling, only one variable is changed in each case. The difference between Case 1 and Case 2 is a change in OIW concentration (and associated PW chemical profile) from 15 to 30 ppm, respectively. This is also the difference between Cases 3	

	and 4, but here with addition of cooling water. All these cases (Cases 1 through 4) examine the distribution of produced water at a discharge rate of 30,000 m³/day. Cases 5 and 6 (see revised Produced Water Modelling report in Appendix I appended to this Response Document) examine the distribution of produced water at a discharge rate of 50,000 m³/day at the 30 ppm OIW concentration. Case 5 is without the additional of cooling water, whereas Case 6 includes the addition of cooling water. The influence of different salinities (be they for PW or cooling water) on the distribution of the discharge was not assessed. Response to Part D of this IR provides clarity on salinity of the discharges. Updates to the EIS are not required. C. The salinity of produced water was between 30 and 36 ppt (see response A, above). For modeling, the mid-point of the salinity range for produced water (i.e., 33 ppt) was used. The salinity of cooling water was 33 ppt. Since both salinities were the same, the addition of cooling water does not affect the salinity of the discharge. A footnote will be added to Table 2-1 of the produced water modelling report (Appendix I in this Response Document) stating the following: ***"Temperatures for produced water and cooling water were 40 °C and 35 °C, respectively. Salinity was 33 ppt for both produced water and cooling water. In Table 2-1, temperature and salinity are weighted averages of produced water and cooling water temperature and salinity. Because salinity for produced water and cooling water was the same, salinity does not vary across cases."*** D. Near source, a higher salinity plume could extend deeper into the water column. However, the influence of higher salinity will be offset by the influence of the higher temperature of the discharge relative to that of the receiving environment. The produced water plume exits at approximately 40 °C into a 3 to 4 °C environment. Therefore, the initial buoyancy of the plume is likely governed predominantly by temperature rather than salinity. All things being equal (i.e., ignoring the influence of temperature), currents at the surface are marginally stronger than they are deeper in the water column. For instance, a mean current speed of 17 cm/s was noted at a depth of 25 m in June 2015, a mean speed of 15 cm/s was noted at approximately 50 m, and current speeds as low as 6 cm/s were noted below 500 m (see Appendix B, in Appendix J). With weaker currents, the plume would disperse more slowly leading to higher concentrations of produced water constituents near-source. In reality, the influence of temperature on the plume would likely still restrict it to the upper 50 m of the water column, where current speeds are relatively consistent. Therefore, only a marginal change would be expected. E. Updates to the EIS, as required, are noted in the responses above.

IR-277	**Guideline Ref:** Part 2, Section 7.2	**EIS Ref:** Appendix J, Section 3
ECCC-46		
Context/Rationale	In Appendix J, Section 2 of the EIS, it is not clear how the current speed and direction for the top 25 m of water were estimated given that current measurements from 21 depths ranging from 25 to 531 m were used to predict current speed and direction time-series for produced water modelling. Given that model results indicated higher concentrations of oil-in-water, some BTEX and two to three PAHs, and phenol within the top 10 m of the water column (Appendix J, Abstract of the EIS) it is important to understand how the speed and direction of the upper layer of water was determined.	

Request 15-Apr-19	In Appendix J, Section 2 of the EIS, clarify how the current speed and direction in the top 25 m of water were modelled, given that the release depth of the produced water is assumed to be 20 m.
Equinor Response 15-Nov-19	The following text will be added to Section 3 in Appendix J: "***Currents at 25 m were applied to 0 to 25 m depths layers for modelling. An inspection at HYCOM modelled (daily) currents suggests speeds will be stronger closer to the surface than at 25 m (see Appendix B for details). Since stronger current speeds would result in increased dilution, using the lower currents speeds measured at 25 m in this modelling exercise is consistent with a conservative approach."***

IR-278	**Guideline Ref:** Part 2, Section 7.2	**EIS Ref:** Section 9.2.2.2
ECCC-47 **CEAA-108**		
Context/Rationale	In Section 9.2.2.2 of the EIS, the Project's produced water is predicted to be 40 degrees C at the discharge source. Section 9.2.2.2 of the EIS cites a produced water modelling study for a Norwegian operation with higher discharge temperatures (70 degrees C) and rates (150,000 m³/day) relative to the produced water rates for the Project, which were estimated to have negligible effects on the environment (SINTEF 2014). Based on this, thermal plume (37.7 – 40 degrees C) was not assessed as part of the produced water discharge modelling. It is not clear that the example of the Norwegian operation is applicable to this project, given potential differences in the receiving environments from both physical and ecological perspectives.	
Request 15-Apr-19	In Section 9.2.2.2 of the EIS, assess the thermal plume as part of the produced water discharge modelling, in order to inform its potential for effects on fish or fish habitat.	
Equinor Response 15-Nov-19	Produced water plume modelling was not a requirement of the EIS Guidelines. Therefore, the scope of produced water modelling was determined in consultation with Equinor in-house experts on produced water discharges and the produced water and included consideration of previous modeling undertaken for existing production operations offshore NL As explained in response to IR-143/ECCC-34, the use of international studies (i.e., Sintef 2014) to describe effects is an accepted approach used in previous environmental assessments for offshore development projects, most recently the Hebron Project and the White Rose Extension Project. As described in Section 9.2.2.2 of the EIS and illustrated in the Produced water modelling Report (see amended report in Appendix I to this Response Document), the produced water plume disperses rapidly from the discharge source. However, for clarity for the reader regarding potential thermal effects, the text in Section 9.2.2.2 will be amended to read as: "~~The area of effect for coolant waters for Hebron Project that had higher discharge rates (1.1 m³/s) was estimated to be 500 m of the discharge source and within the produced water plume (Amec Foster Wheeler 2017).~~ In a produced water modelling study for a Norwegian operation, discharges at higher temperatures (70°C) and discharge rates (150,000 m³/d), ***which are much higher than those estimated for the BdN Project***, ~~relative to the produced water rates for the Project,~~ were ~~also~~ estimated to have negligible effects of excess temperature on the environment	

	(SINTEF 2014). ***The low potential for thermal effects is also consistent with projects in the Newfoundland and Labrador Offshore Region. The zone of influence for coolant waters for Hebron Project that had higher discharge rates (1.1 m^3/s) was estimated to be 500 m of the discharge source and within the produced water plume (Amec Foster Wheeler 2017).*** ***The EEM program for Hibernia project collects samples within the 50 m of the platform where produced water can be detected (HMDC 2019). There are also water sampling stations at 100 m, 200 m and 16,000 m from source (HMDC 2019). Hibernia discharged produced water at rates of approximately 16,000-17,000 m^3/day in 2016 with temperatures of 82°C (HMDC 2019). Overall, temperature profiles were generally similar across stations, but with different rates of change. The upper mixed layer of water has homogenous temperature values as a result of turbulent mixing processes (HMDC 2019). The temperature profile at the reference station is characterized by temperature decreases of approximately 13.3°C (-0.5°C to 12.8°C) (HMDC 2019) below the mixed layer between 30 and 60 m. At a station <50 m from the platform, the thermocline was not as steep with a decrease in temperature of approximately 7°C (6.1°C to 12.6°C) below the mixed layer from 27-32 m (HMDC 2019).This was followed by a decrease in a half degree to approximately 46 m and a sharp decrease of approximately 6°C (0.2°C to 6.1°C) near bottom at 70 m depth (HMDC 2019). Stations closest to the platform (<50 m) had two distinct decreases in temperature, an indicator of the produced water plume, whereas temperature only decreased sharply once for the 16,000 m station (HMDC 2019). The temperature profile at stations beyond 100 m had the same patterns as water monitoring stations 16,000 m away from the platform (HMDC 2019). Therefore, temperature follows a similar pattern as with other produced water constituents with rapid dilution and dispersion of the produced water plume. The Hibernia EEM results indicate that the "discharge of produced water did not have a detectable effect on surrounding seawater" (HMDC 2019). The coolant waters zone of influence for BdN*** ~~FPSO~~ ~~coolant waters area of effect~~ is therefore likely to be localized. Modelling of the ~~mixed~~ produced water ~~and~~ ~~cooling water~~ plume (Case 5, Figure 9-) indicates that the extent of the plume is primarily within 2 km from the source with highest concentrations within 100 m. (Deblois ***2019*** in Appendix J).***"*** References: ***HMDC; Hibernia Management Development Company (2019). Hibernia Platform (Year 10) and Hibernia Southern Extension (Year 3) Environmental Effects Monitoring Program (2016): Volume I – Interpretation. Report prepared by Amec Foster Wheeler. Project No. TF1675220.***

IR-279	**Guideline Ref:** Part 2 Section 7.3.1, Section 7.3.3; Section 7.3.4	**EIS Ref:** Appendix J
DFO-133		
Context/ Rationale	In the DREAM Model used in Appendix J of the EIS, the frequency of produced water release occurrences is not clear. The DREAM model, used in Appendix J of the EIS, predicts the potential plume of produced water in the month of June and reports that this month represents the most vulnerable period for planktonic organisms.	

	The currents recorded in this area are significantly lower in June than at any other time of year. While lower currents will result in less dilution of the plume, the potential distance of the effects may be greater. It is unclear why the constituents of produced water used to parameterize DREAM are standard average profiles observed by Equinor from their existing developments. The selection of salinity is unclear. Salinities of Hibernia produced water range between 46 and 195% (Ayers and Parker 2001 as cited in Neff et al 2011). Salinity of the discharge will determine its density and thus its behavior once it enters the sea. Highly saline produced water will be denser than seawater and will sink. For example Nui et al. (2016) using field observations and DREAM modeling found that the produced water plume (salinity 204 ppt) from the Venture platform on the Scotian Shelf sunk and intersected the bottom (Z = ~ 25 m) almost directly underneath or very close to the platform. The constituents of produced water used to parameterize DREAM are standard average profiles observed by Equinor from their existing developments. The effect of produced water release into the waters of the Flemish Pass on the connectivity of vulnerable marine ecosystems and economically important invertebrate stocks has not been assessed. Referencing the statement "…model will run with either two- or three-dimensional current fields. Two–dimensional fields may be either steady or time varying, supplied from hydrodynamic models or estimated by the user from local knowledge or current atlases. Three–dimensional time-varying fields from hydrodynamic models can be imported for selected formats.", (Page 6, Appendix A in Appendix J of the EIS) currents from a 3D model (e.g., HYCOM, such as in Appendix F) should have been used. In Appendix A of Appendix J of the EIS, it is not clear from the description if "Adsorption/ Desorption Partitioning" was turned on for the Bay du Nord modelling exercise (Appendix A, Page 12-13). Produced water is complex and variable in composition and significant flocculation is known to occur when it is introduced into the receiving environment.
Request 15-Apr-19	A. Clarify the frequency of produced water releases B. Explain and discuss any additional effect from one release to the next (e.g. volumes, constituents, etc.) as the concentration of a certain release could be additive to a previous release and accumulate, thus change the concentrations reported. C. Describe the p in this planktonic species that are most vulnerable in June and their ecological and economic value. Take into account the fact that very few of the spawning periods for sensitive benthic species are well known - the only ones know to spawn in June are only in the water column for a few minutes (Kenchington et al. 2018). D. Discuss limitations of selecting June for modelling with respect to currents and resultant conclusion of the effects assessment. E. Explain why constituent profiles from the existing Grand Banks production fields were not used if, as stated in the EIS, characteristics of the Bay du Nord crude, are very similar to those for Hibernia. F. Justify the rationale for using a salinity of 33ppt in the DREAM model (Table 2.1). G. Discuss how salinity would alter the behavior of the plume and the potential for environmental effects.

	H. Assess and discuss the effect of produced water release into the waters of the Flemish Pass on the connectivity of vulnerable marine ecosystems and economically important invertebrate stocks. I. Provide a rationale for using time-varying but spatially uniform currents (from a single point). Explain how flocculation of produced water components result in sedimentation of contaminated flocs, as well as the zone of effect of such material.
Equinor Response 15-Nov-19	A/B For the purposed of effects assessment, and to account for worst-case discharges, the EIS assumes that produced water will be released continuously, using the maximum discharge rate of 50,000 m³/d, over the life to the Project. The model accounts for a continuous release over the course of a 30-day period. Therefore, any accumulation of constituents in the water column is accounted for (also see Figure 2 and associated text in response to Part C (below)). The graphics on various days provided in Figure 6-1 and in the Appendices are snap-shots over the course of the 30-day run. Any day/moment could have been selected for display. The text in Section 1 of Appendix J will be amended to read as follows: "However, since most plankton would be in the water column in Spring, June (with the lowest wind speed of the two Spring months) was selected, in keeping with the worst-case scenario approach. ***Results of continuous discharge over 30 days in June are provided herein"***. C. As explained in response below (Part E) and in IR-280/DFO-2, June was selected as a worst-case scenario. A characterization of plankton in the Core BdN Area and surrounding region is described in Section 6.1.5 of the EIS. Important species in the near surface waters where there are potential effects from the produced water plume would include the copepod *Calanus finmarchicus* (Section 6.1.5). This species abundances peak between mid-March and May and then decline until late August and is an important prey species for planktivorous fish (Section 6.1.5). For sensitive benthic species including corals and sponges, many are gonochoric (distinct sexes) and therefore require close proximity between spawning individuals. In general, primary areas for invertebrate spawning are generally areas with high densities of invertebrates as described in Section 6.1.7.8.). The presence of larvae from sensitive coral and sponge species in the upper water column is not known as dispersal may occur in surface waters or with deep sea currents (See response to IR-257/DFO-124). The position of larvae within the water column and larval durations are not well studied for many cold water corals and sponges and have generally been derived from similar species in shallower waters (Kenchington et al. 2019). As noted in the IR request, Kenchington et al. (2019) indicated planktonic larval durations of minutes in June for some species. However, this is based on a shallow water, Mediterranean coral where the larvae settle on the parent coral and are therefore not in the upper water column (Kenchington et al. 2019). Information from counterpart species in other regions suggest that corals and sponges with lecithotrophic (non-feeding) larvae may have short duration, deepwater dispersal (Kenchington et al. 2019) that would be outside the potential zone of influence for produced waters. However, there are other benthic invertebrates (e.g., echinoderms) that have long duration lecithotrophic larvae (Kenchington et al. 2019). To clarify, text in Section 9.2.2.2 of the EIS will be amended to read as: "Scallops are the only taxa that have shown elevated hydrocarbon and metal (barium) concentrations in somatic tissues in close proximity (<1 km) to a

	production installation (EMCP 2017). ***Plankton in the upper water column may be exposed to produced water, although effects, including those on connectivity, would be limited with the low spatial extent of the produced water plume. For cold water corals and sponges, the larval behaviour within the water column and larval durations are not well studied (Kenchington et al. 2019). Dispersal for these organisms have been estimated to be in the upper 100 m or deep water based on information on similar species in shallow waters (Kenchington et al. 2019). Due to the low mobility of many benthic invertebrates and the need for spatial proximity between spawning individuals, primary areas for invertebrate spawning are generally areas with high densities of invertebrates (see Section 6.1.7.8). As the final layout design will take into consideration the coral and sponge survey data, and the extent of the produced water plume is limited, potential effects on larval stages of coral and sponges would be low.*** " D. June provides a worst-case scenario (refer to response to IR-280/DFO 2). Based on wind speeds recorded by Fisheries and Oceans Canada from 1962 to 2015, May, June, July and August are the calmest months of the year. Results are generally applicable to these four months. Winds speeds are higher in remaining months, including April (see IR-280/DFO-2), which would lead to faster dispersion of the plume and reduced exposure. Selection of June was the most conservative approach, with environmental risk for higher wind speed months expected to be less than those for June. The one limitation to using June is that currents during other months of the year, although faster, may not be to the south/southeast. However, estimates of the zone of influence in Appendix J speak of distance from source and only this variable, rather than direction, is used in the EIS. As noted above, the reviewer raises questions concerning the potential for currents to cause the plume to disperse further. Using June currents, the following figure shows concentrations of a theoretical constituent over the entire modelled area at low current speeds (Figure 1, panel A below) and at high current speeds (Figure 1, panel B below). Panel C and D of the figure also show predicted environment concentrations (PEC) over predicted no-effects concentrations (PNEC) for this theoretical constituent. Where PEC/PNEC >1, cells are over the no-effects threshold. It is true that the plume extends further at higher current speed (compare panels A and B). However, the area over threshold is smaller (compare the red area in panels C and D). Even if distance from source rather than total area was considered, cells over threshold extend to approximately 6 km from source at low current speeds, while cells over threshold at faster current speeds extend to approximately 4 km. We reiterate that this is a theoretical example. Discharge concentrations were high, and the no-effects threshold was low, to provide a clear example.

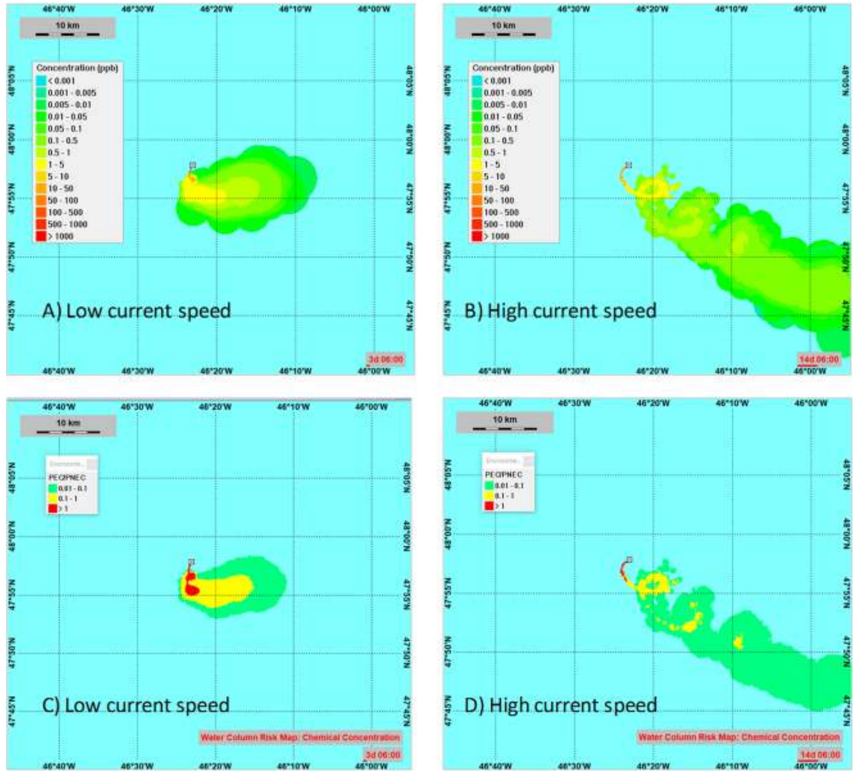


Figure 1. Panels A & B: Concentration of a theoretical constituent under low current speed (A) and under high current speed (B). Panels C & D: PEC/PNEC under low current speed (C) and under high current speed (B).

During the Regulatory Review Workshop, concern was also noted about modelling a single month, rather than 1 year or 30 years. What is presented in Appendix J is the probability that cells will exceed threshold relative to distance from source. As noted in the Appendix, this is calculated as the number of model outputs above threshold in that cell over the total number of outputs in a 30-day simulation X 100. It is demonstrated above that faster currents decrease concentrations. Therefore, including the remainder of the year, and faster currents, would decrease these probabilities, again illustrating that using the slower current month is the most conservative approach. Finally, unlike sediments, there is no long-term accumulation of constituents in the water column. If this was the case, then the number of cells over threshold would generally increase over the course of even a 30-day simulation. This is not the case. Concentrations do increase during the first few model time-steps but, as can be seen from Figure 1, higher concentrations occur on day 3 and lower concentrations occur on day 14. This is also shown in Figure 2 below, showing the number of cells over threshold for this theoretical constituent over the course of the 30-day simulation window. There is no increasing trend in the number of cells over threshold.

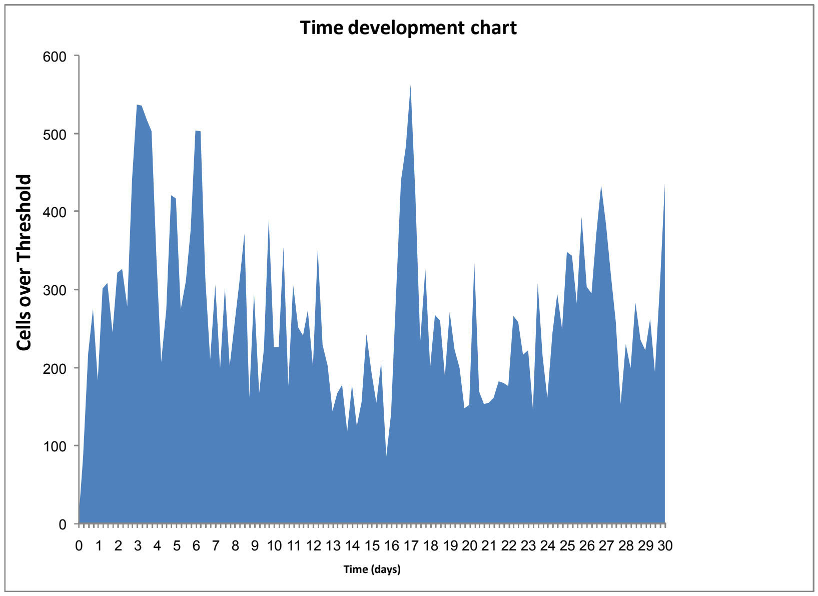


Figure 2. Number of cells over threshold for a theoretical constituent over the 30-day modeling window.

E. The approach used in the produced water plume modelling is consistent with the approach used by Equinor for its development projects. As a produced water sample from BdN, with sufficient volume to analyze for all its constituents was not available, it was decided to use the information available on naturally occurring constituents for existing Equinor offshore facilities - using average values for fields with similar oil properties. This is an approach Equinor uses in Norway, whereby a generic produced water profile is used for plume modelling.

F. See response to IR-276/ECCC-45

G. See response to IR-276/ECCC-45

H. In this study generic toxicity thresholds (Predicted No Effect Concentrations – PNECs) established by OSPAR were used. These PNECs are applied for the naturally occurring constituents in PW in this modelling study and have been derived from preferably long-term chronic (if available) toxicity for all different water column living species (both marine and freshwater), derived from scientific published literature. This means that the thresholds applied do not account for sensitivity of the actual species at the specific location but is generic, therefore they can be applied in risk assessments worldwide. The OSPAR PNECs (published in 2012) are very conservative (precautionary) since they are based on the toxicity data on the most vulnerable/sensitive species (and life stages) available. Additionally, the toxicity data and thresholds are based on long-term constant exposure while the exposure time in the marine environment is normally of much shorter time and is fluctuating due to dilution and active movement (e.g., mobile fish and invertebrates) in and out of the PW plume, therefore a more conservative approach.
The response to IR-257/DFO-124 details information on the connectivity for commercially important invertebrate species (e.g., northern shrimp) (Le Corre et al. 2019) and sensitive benthic species (e.g., corals and sponges) (Kenchington et al. 2019). As noted above and in response to Part E above, the overall potential effect of produced waters would be low to sensitive benthic organisms such as corals and sponges for which vulnerable marine ecosystems were established. Similarly, as the produced water spatial extent is low, PNECs are conservative, and the source

	populations are far from the Project Area, effects on the connectivity of commercial species such as northern shrimp would be low. l. See response to IR-272/DFO-131 Part D; IR-273/DFO-42. Produced water plume modelling was not a requirement of the EIS Guidelines, therefore the scope of produced water modelling was determined in consultation with Equinor in-house experts on produced water discharges and the modeler, Elisabeth Deblois. The model does not examine accumulation in sediments. References: ***Le Corre, N., Pepin, P., Han, G., Ma, Z., and Snelgrove, P.V. 2019. Assessing connectivity patterns among management units of the Newfoundland and Labrador shrimp population. Fisheries Oceanography, 28(2): 183-202.*** ***Kenchington, E., Wang, Z., Lirette, C., Murillo, F.J., Guijarro, J., Yashayaev, I., and Maldonado, M. 2019. Connectivity modelling of areas closed to protect vulnerable marine ecosystems in the northwest Atlantic. Deep Sea Research Part I: Oceanographic Research Papers, 143: 85-103.***

IR-280 **DFO-2**	**Guideline Ref:** Part 2 Section 7.2	**EIS Ref:** Section 4.3.4.2
Context/Rationale	The DREAM model, used in Appendix J of the EIS, predicts the potential plume of produced water in the month of June and reports that this month represents the most vulnerable period for planktonic organisms. The currents recorded in this area are significantly lower in June than at any other time of year. While lower currents will result in less dilution of the plume, the potential distance of the effects may be greater.	
Request **15-Apr-19**	Provide reference(s) for the statement in Section 4.3.4.2 of the EIS "June has been previously identified as the most sensitive month based on published research and discussion with Fisheries and Oceans Canada (DFO)".	
Equinor Response **15-Nov-19**	Literature was examined and various individuals at DFO were contacted in 2007 when the first EIF was conducted for the Newfoundland Offshore. However, as this first EIF was an internal document, that effort was not documented. Since then, June has been used in all other EIFs for the region, including those submitted to regulatory agencies as part of produced water re-injection studies. June was selected to represent the current condition in this study; a month represented with "calm" conditions (weak currents and wind conditions) than at any other time of year and therefore is a conservative approach for the prediction of concentrations of produced water constituents in the receiving environment since lower currents will result in less dilution of the plume, the potential distance of the effects may be greater. Nevertheless, since the sentence in question cannot be referenced, the text in Section 1 of Appendix - J Produced Water Modelling Report will be revised to read as: "DREAM simulations for produced water generally are carried out during times when biological resources are most vulnerable, either because of sensitivity of life stages or because of low turbulent mixing and possibility of higher levels of exposure, or both. This approach is conservative in that it provides worst-case-scenario estimates. *In Norway, the month of May is simulated. In Newfoundland,* ***wind speeds (which drive surface currents) are lowest in May, June, July and August. Average wind speeds in these months are 7.4 m/s, 6.9 m/s, 6.2 m/s and 6.7 m/s, respectively, versus 8 to 12 m/s in the remainder of the year (Fisheries and Oceans Canada MSC50 data at 47.9 Latitude and -46.4 Longitude for the period 1962 to 2015).***	

	With respect to turbulent mixing, any of these months could have been used for modeling. However, since most plankton would be in the water column in Spring, June (with the lowest wind speed of the two Spring months) was selected for modeling, in keeping with the worst-case scenario approach. Results of continuous discharge over 30 days in June are provided herein. The text in Section 4.3.2 of the EIS will be modified to read as: "DREAM simulations for produced water generally are carried out during times when biological resources are most vulnerable, either because of sensitivity of life stages or because of low turbulent mixing and possibility of higher levels of exposure, or both. This approach is conservative ***in that it provides worst-case-scenario estimates. As stated in Appendix J, since most plankton would be in the water column in Spring, June (with the lowest wind speed of the two Spring months) was selected for modeling, in keeping with the worst-case scenario approach.*** ~~Offshore Newfoundland, June has been previously identified as the most sensitive month based on published research and discussion with Fisheries and Oceans Canada (DFO)."~~

IR-281 **DFO-134**	**Guideline Ref:** Part 2 Section 7.3.3	**EIS Ref:** Appendix L
Context/Rationale	DFO is of the view that the seismic pulse reverberation (see Section 4.2 in Appendix L of the EIS) not only likely masks the communication and feeding functions of marine mammal sounds, but had a strong effect on the recall performance of the JASCO autodetectors and resulted in fewer mysticete detections than were likely present. This is evidence that supports a higher level of manual validation of recorded underwater calls than has been conducted (5%).	
Request **15-Apr-19**	Justify rationale for manually validating only 5% of underwater calls recorded by JASCO autodetectors, and consider additional validation.	
Equinor Response **15-Nov-19**	The EIS Guidelines state (Section 4.3): "Except where specified by the Agency, the proponent has the discretion to select the most appropriate methods to compile and present data, information and analysis in the EIS as long as they are justifiable and replicable." Based on this, the EIS team used their professional judgement and experience to scope the baseline data. The 5% manual analysis was performed on 90 seconds at the middle of each 1800 second (30 minute) data file. In JASCO's experience this is an effective method for determining the daily presence of marine mammals, even in noisy data. For the purposes of environmental assessment, the data provide species presence in the area on which the effects assessment is based. The data are not considered as a representative baseline for mammal presence in the absence of oil and gas activity. It is Equinor Canada's opinion that the information provided in the EIS is sufficient to make impact predictions.	

3 Updates to air emissions text Chapter 2 of the EIS

Upon review of the air emissions information in the EIS, to correct some miscalculations and in light of some of the comments and questions from reviewers, the following edits will be incorporated into the EIS.

Section 2.2.1

Equinor's strategy is to reduce CO_2 emissions by 3 million tonnes per year by 2030 to meet and a ***portfolio*** carbon intensity target of 8 kg CO_2/per barrel of oil equivalent (boe) for oil and gas production operations (Equinor 2018a).

Section 2.7.1.3

Recoverable heat in the reciprocating engines power solution is estimated at 10 MW to 12 MW, with a corresponding CO_2 reduction of approximately ***25,000 to 30,000*** ~~50,000 to 60,000~~ tonnes CO_2/year on average, compared to production of the same amount of heat in a gas fired heater.

Section 2.8.1

- The CO2/boe estimates provided in Section 2.8.1 were based on anticipated production estimates. These values are changing and will not be known until design is complete. Therefore, the following text will be deleted from Section 2.8.1.

  "The specific CO_2 emissions, or CO_2 intensity, of a project, expressed as kg CO_2/boe, is frequently used in the industry to document environmental performance of a project and compare the performance to other projects. The CO_2 intensity for the Project based on preliminary design data as of November 2018, is calculated at 6.7 kg CO_2/boe in the reciprocating engines power option, and 7.5 kg CO_2/boe in the gas turbine power option. These estimates may change as engineering and design progresses, see also Sections 2.7.1.2 and 2.7.1.3."

As noted in Section 2.7.1.2, there are 2 power options under investigation for the FPSO, reciprocating engines and gas turbines. Figure 2-14 of the EIS is for the reciprocating engines option. Figure 2-14 will be replaced by the following updated Figure 2-14, and a new figure, Figure 2-15, which provides estimated CO_2 emissions for the gas turbines option, will be included in the EIS. The text preceding Figure 2-14 will also be modified to read as:

"As illustrated in Figures 2-14 ***and 2-15***, the largest source of CO_2 emissions is associated with power generation on the FPSO, which contributes approximately 85 percent of the total CO_2 and GHG emissions over the lifetime of the field. In the initial stages of the Project during drilling (approximately three to five years in duration) and later in the field life, if undertaken during Potential Future Development, the contribution to air emissions from power generation from the drilling installation are more notable, but much less than power generation on the FPSO. Emissions from offshore construction activities show a similar increase in the early Project phases and again should Potential Future Development occur, but emission volumes are much less. Minor contributions from flaring, OSV and SBVs, helicopters and shuttle tankers will apply throughout the lifetime of the Project."

Revised Figure 2-14

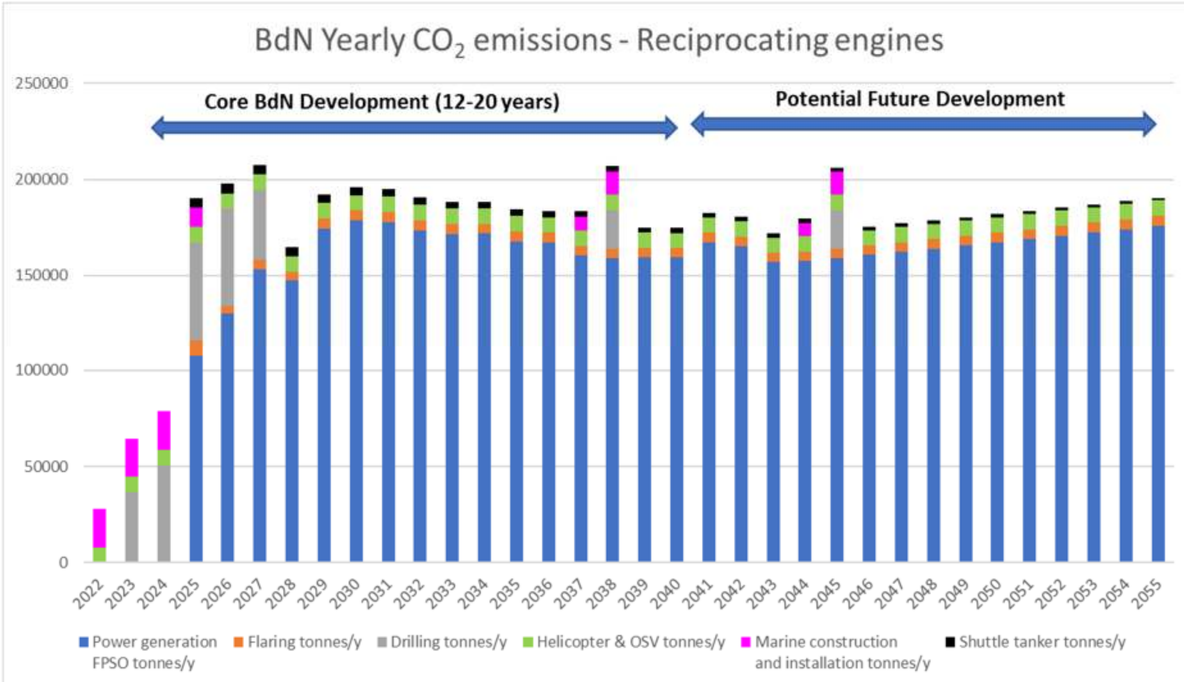


Figure 2-14 **Lifetime Estimated CO_2 Emissions from the Project - Reciprocating Engines Option (based on preliminary design as of November 2018)**

New Figure 2-15

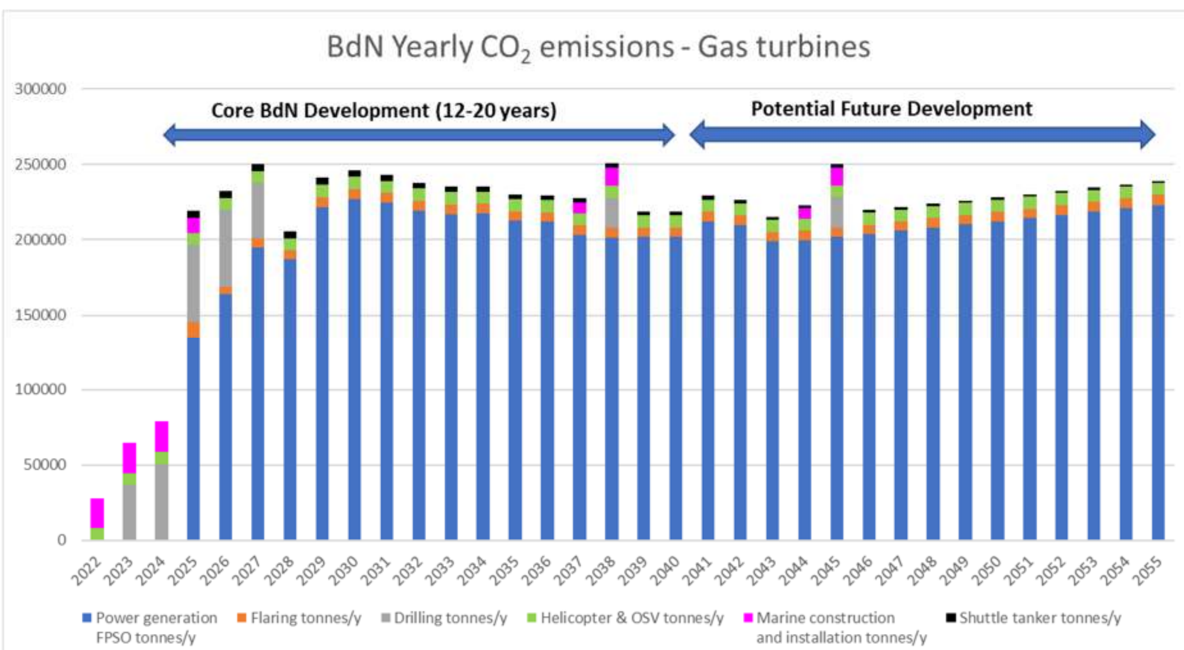


Figure 2-15 **Lifetime Estimated CO_2 Emissions from the Project – Gas Turbines Option (based on preliminary design as of November 2018)**