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

Appendices A to J

APPENDIX A:

INFORMATION TO SUPPORT RESPONSE TO IR-30/CEAA-110, IR-269/CEAA-106

Table 3.4 Meetings and Discussions with Nunatsiavut Government

Date	Activity	Purpose and Focus
June 13, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor.
June 21, 2018	Outgoing Email	Notification of filing of Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter including Project summary and map.
June 29, 2018	Outgoing Phone Call	Follow-up phone call to discuss next steps in engagement. Left voicemail.
July 6, 2018	Outgoing Phone Call	Follow-up phone call to discuss next steps in engagement. Left voicemail.
July 18, 2018	Outgoing Phone Call	Follow-up phone call to discuss next steps in engagement. Left voicemail.
July 23, 2018	Outgoing Email	Email requesting President or designate contact for Equinor Canada to discuss next steps in engagement.
August 2, 2018	Incoming Phone Call	Parties discussed next steps in engagement including timing of an in-person meeting and conference call.
August 2, 2018	Outgoing Email	Follow-up email confirming substance of phone call of August 2.
August 8, 2018	Outgoing Email	Proposal to meet with Nunatsiavut Government in Goose Bay week of September 17.
August 24, 2018	Incoming Email	Confirmation of availability to meet in Goose Bay on September 17.
August 27, 2018	Outgoing Email	Discussion of possible meeting dates.
August 27, 2018	Incoming and Outgoing Emails	Email correspondence to confirm date, time and location of meeting in Goose Bay
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss BdN Project, potential effects and proposed mitigation.
September 6, 2018	Incoming Email	Regarding meeting venue, agenda and materials.
September 6, 2018	Outgoing Email	Confirmation of venue and details regarding expense reimbursement.
September 12, 2018	Outgoing Email	Transmission of meeting materials (i.e. PowerPoint presentation, agenda) and discussed logistical details.
September 13, 2018	Incoming and Outgoing Emails	Reimbursement instructions, estimate of costs and completed forms.
September 14, 2018	Outgoing Email	Confirmation of meeting details.
September 17, 2018	In-Person Meeting	Delivery of PowerPoint presentation and Project overview. Discussion of issues of concern and next steps in engagement.

September 18, 2018	Outgoing Email	Follow-up to meeting providing link to information and confirming next steps in engagement.
October 11, 2018	Workshop	Half day workshop in St. John's to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 12, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments.
October 15, 2018	Incoming Email	Transmitting materials regarding geophysical testing.
October 18, 2018	Outgoing Email	Confirmation of geophysical testing information and commitment to circulate internally.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	Request for any additional comments on environmental effects/mitigation measures.
November 14, 2018	Incoming Email	Received Nunatsiavut Government's edits to community profile in Chapter 7.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.
April 10, 2019	***Outgoing E-mail***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	***Response***	***EIS Reference***
Project Schedule – questions concerning timing of key Project activities	***Details respecting the Project schedule, including timing of key Project activities and regulatory processes have been provided to Indigenous groups during Equinor Canada's ongoing engagement activities. In addition, Project details were summarized in a power point presentation which was provided to each Indigenous Group and discussed at in-person meetings (see Appendix [##]. A full discussion of the Project schedule and associated activities and milestones is contained in EIS Chapter 2.***	***Section 2.1.1***
Treatment of Discharges (Produced Water) and potential impacts on fish and fish habitat	***Equinor Canada will treat produced water as well as other discharges using best treatment practices that are commercially available and economically feasible. A description of the proposed treatment package for produced water is provided in Section 2.7.1.5 of the EIS. All discharges will be treated in accordance with applicable regulatory requirements and the OWTG. The potential impacts of emissions and discharges on Fish and Fish Habitat are identified and assessed in Chapter 9.***	***Section 2.7.1.5*** ***Section 9.2.2.2*** ***Section 9.2.2.3*** ***Section 9.2.3.2*** ***Section 9.2.3.3***

Accidents and Malfunctions (spill modelling) – information about possible spill trajectory and spill response	***Chapter 16 provides a description of potential accidental events and malfunctions. Equinor Canada has undertaken spill fate and effects modelling of representative worst-case spills, including an unmitigated subsurface blow-out. The results of modelling predict that the greatest concentration of surface hydrocarbons will be at the release site and the majority will be transported east and south. In the extremely unlikely event of a subsurface blowout, and without the application of mitigation measures, modelling indicates that less than one percent of the total volume released is predicted to make contact with the shore line and most of that oil is predicted to make contact on the Avalon Peninsula and localized areas of the Burin Peninsula. Oil making contact with the shoreline would be highly weathered, and degraded and patchy and discontinuous. Equinor Canada's spill response measures are set out in Chapter 16 and additional information on Well Intervention Response Strategies and related matters is contained in Appendices [##]. Equinor Canada is prepared to effectively respond to an oil spill offshore and is equipped with the necessary response tools, personnel and strategies. A key focus is on prevention. Spill prevention will be incorporated into Project design and operations and facilities, processes and management system procedures are intended to reduce or eliminate the chance of a spill. All plans respecting a response to accidental events are submitted to the C-NLOPB for review and approval as part of the regulatory authorizations process.***	***Section 16.1*** ***Section 16.4.3*** ***Section 16.4.4***
Impact of Project on subsistence and commercial fish species	***Through its ongoing engagement activities as well as information contained in the Indigenous Knowledge Desktop study, Equinor Canada is aware of the social, cultural, traditional and economic importance of fish and fish habitat to Indigenous groups. Information on fish species of either traditional or commercial importance has been incorporated into baseline information (see Chapters 6 and 7) and the potential effects (both direct and indirect) of the Project upon marine fish and fish habitat, commercial and subsistence fisheries and associated mitigation measures are discussed in Chapters 9, 13 and 14 respectively. These chapters conclude that no potential effects upon subsistence fishing activities from routine Project activities are predicted. While no significant adverse effects upon commercial fish species or the commercial fisheries are predicted,***	***Section 6.1*** ***Section 7.1*** ***Section 7.3.8*** ***Section 9.4*** ***Section 13.1.5*** ***Section 13.2*** ***Section 13.4*** ***Section 13.5*** ***Section 14.1.5***

	proposed mitigation measures for commercial fisheries will include the following: • Ongoing communication with commercial fishers 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) 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. • Implementation of a standard marine communication protocol to promote safe practices between commercial fishing enterprises, other marine users and BdN operations. • Issuance of Notices to Shipping and Notices to Mariners (where appropriate) regarding planned Project activities. • Compensation for damage or loss in accordance with C-NLOPB Guidelines in accordance. ***The effects of accidents and malfunctions upon subsistence and commercial fisheries are identified and assessed in Chapter 16.***	

Table 3.5 Meetings and Discussions with Innu Nation

Date	Activity	Purpose and Focus
June 13, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor
June 21, 2018	Outgoing Email	Notification of filing of BdN Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter including Project summary and map.
June 27, 2018	Outgoing Phone Call	Follow-up to discuss next steps in engagement. Left voicemail.
June 28, 2018	Outgoing Phone Call	Follow-up to discuss next steps in engagement. Left voicemail.
July 6, 2018	Outgoing Phone Call	Follow-up phone call to discuss next steps in engagement and scheduling of an in-person meeting.

July 6, 2018	Outgoing Email	Expressing commitment to engage and to continue to provide Innu Nation with information. Confirmation of availability for an in-person meeting.
August 6, 2018	Outgoing Email	Follow-up requesting a phone call to set up an in-person meeting in September.
August 8, 2018	Outgoing Email	Proposal to meet in Goose Bay during the week of September 17.
August 9, 2018	Incoming Email	Committing to respond to meeting request during week of August 13.
August 9, 2018	Outgoing Email	Regarding meeting in Goose Bay.
August 27, 2018	Outgoing Email	Follow-up email regarding proposed meeting in Goose Bay the week of September 17
August 27, 2018	Incoming Email	Commitment to discuss proposed Goose Bay meeting with leadership.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss BdN Project, potential effects and proposed mitigation.
September 10, 2018	Outgoing Email	Confirmation of availability to meet in in Goose Bay on September 17. Offer to hold conference call if in-person meeting not possible.
September 10, 2018	Incoming Email	Confirmation of interest in meeting and undertaking to provide potential dates.
September 11, 2018	Incoming and Outgoing Emails	Email chain arranging meeting between Equinor Canada and Innu Nation in Goose Bay on September 18.
September 11, 2018	Outgoing Email	Email transmitting PowerPoint presentation for discussion at September 18 meeting.
September 14, 2018	Outgoing Email	Confirmation of time and location of September 18 meeting.
September 14, 2018	Outgoing Email	Transmission of meeting agenda.
September 18, 2018	In-Person Meeting	Delivery of PowerPoint presentation and Project overview. Discussion of issues of concern and next steps in engagement.
September 19, 2018	Outgoing Email	Follow-up to meeting providing link to information and confirming next steps in engagement.
October 19, 2018	Workshop	Half day workshop in Moncton to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments.
October 23, 2018	Outgoing Email	Request for clarification on the next steps in engagement.

November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	Follow up to workshop, transmitting invoicing information and requesting further comments regarding potential effects / mitigation measures.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	***Response***	***EIS Section Reference***
Need for Ongoing Engagement (Information exchange)	***Equinor Canada is committed to continuing to provide opportunities to Indigenous groups 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 will be developed through discussions with the various groups.***	***Section 3.3*** ***Section 18.4.1***
Publication of Monitoring Reports	***Monitoring reports will be published in accordance with applicable regulations or as may be required by any conditions included in the environmental Assessment Decision Statement issue by the CEA Agency. Section 18.4 provides a complete listing of proposed environmental monitoring and observation programs for routine Project activities.***	***Section 18.4***
Accidents and Malfunctions – ecosystem impacts	***Chapter 16 of the EIS contains an assessment of the potential environmental effects of accidents and malfunctions upon the marine ecosystem and human users, based upon various worst-case unmitigated spill modelling scenarios (batch spills, SBM spills, subsurface blow-outs and vessel collisions).***	***Section 16.7***
Spill Modelling methodology	***Chapter 16 provides a description of potential accidental events and malfunctions. Three-dimensional oil spill trajectory and fate modelling and analyses for worst-case unmitigated subsurface blowouts and batch spills of crude oil and marine diesel to support the evaluation of environmental effects of accidental events were performed, using the nearfield OILMAPDeep blowout model and the far-field Spill Impact Model Application Package (SIMAP) trajectory, fate, and effects model.*** ***The goal of modelling was to describe a range of possible consequences and exposures of oil***	***Section 16.4***

	releases under various representative scenarios, including that of an unmitigated subsurface blowout. Modelling was based on extremely conservative assumptions and approaches: • Extremely low probability worst case subsurface blowout rates were modelled, with the probability of occurrence of 1 in 207,000,000 to 1 in 414,000,000 • 95th percentile (i.e., worst case scenario) simulation of the results of the 171-172 deterministic model simulations were selected • Batch spill scenarios modelled were very conservative with volumes being greater than the maximum volume of similar spills reported to the C-NLOPB since 1997 • Worst-case environmental (weather) conditions were selected for modelling the batch spill scenarios • All modelled scenarios were 'unmitigated' which assumes no spill response measures were taken. In an actual event, spill response measures would be implemented that would likely reduce the impact of a release.	

Table 3.6 Meetings and Discussions with NunatuKavut Community Council (NCC)

Date	Activity	Purpose and Focus
June 13, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor.
June 21, 2018	Outgoing Email	Notification of filing of BdN Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter including Project summary and map.
June 27, 2018	Outgoing Phone Call	Follow-up phone call. Left voicemail.
June 28, 2018	Outgoing Phone Call	Follow-up phone call to discuss potential meeting, availability of Indigenous Knowledge information and issues of concern with the Project Description. Follow-up call planned for week of July 2.
July 6, 2018	Outgoing Phone Call	Follow-up phone call. Left voicemail.
July 18, 2018	Outgoing Phone Call	Follow-up phone call. Left voicemail.
July 23, 2018	Incoming and Outcoming Emails	Follow-up to June 28 phone call and discussion of meeting in Goose Bay.
July 23, 2018	Outgoing Email	Regarding conference call proposed for July 25.

July 25, 2018	Conference Call	Discussion of next steps in engagement and timing of an in-person meeting. Discussion of possible Indigenous Knowledge study based on migratory marine species. Discussion of implementation of Accord Acts and possible economic opportunities related to the Project.
July 25, 2018	Outgoing Email	Confirmation of intent to meet in September; and commitment to continue to provide NCC with relevant Project-related information. Request for a phone call in August to discuss Project and process for sharing Indigenous Knowledge.
August 6, 2018	Outgoing Email	Requesting call to discuss an in-person meeting in Goose Bay, as well as the process of collection of Indigenous Knowledge.
August 8, 2018	Incoming and Outgoing Emails	Email chain regarding possible meeting in Goose Bay during the week of September 17.
August 8, 2018	Incoming Email	NCC to respond to meeting request within one week.
August 14, 2018	Incoming and Outgoing Emails	Email chain regarding August 15 phone call to discuss an in-person meeting and Indigenous Knowledge.
August 15, 2018	Outgoing Phone Call	Phone call to discuss meeting and Traditional Ecological Knowledge (TEK). Left voicemail.
August 27, 2018	Outgoing Email	Email proposing meeting in Goose Bay week of September 17.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss BdN Project, potential effects and proposed mitigation.
September 5, 2018	Outgoing Phone Call	Discussion with NCC about timing and structure of proposed meeting in Goose Bay.
September 5, 2018	Outgoing Email	Follow-up to phone call identifying potential dates for meeting and including proposed agenda items and PowerPoint presentation.
September 12, 2018	Outgoing Email	Proposing possible meeting times in Goose Bay.
September 13, 2018	Incoming and Outgoing Emails	Email chain confirming availability to meet on September 17.
September 17, 2018	In-Person Meeting	Delivery of PowerPoint presentation and Project overview. Discussion of issues of concern and next steps in engagement.
September 18, 2018	Outgoing Email	Follow-up to meeting providing link to information and confirming next steps in engagement
October 11, 2018	Workshop	Half day workshop in St. John's to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.

October 12, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	Follow up to workshop, transmitting invoicing information and requesting further comments regarding potential effects / mitigation measures.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	***Response***	***EIS Reference***
Accidents – potential impacts of spills on ecosystem	***Chapter 16 of the EIS contains an assessment of the potential environmental effects of accidents and malfunctions upon the marine ecosystem and human users, based upon various spill modelling scenarios (batch spills, SBM spills, subsurface blow-outs and vessel collisions).***	***Section 16.7***
Project Description – relationship to exploration Drilling	***Details respecting the Project, including Equinor's exploration drilling activities, have been provided to Indigenous groups during Equinor Canada's ongoing engagement activities. In addition, Project details were summarized in a power point presentation which was provided to each Indigenous Group and discussed at in-person meetings (see Appendix [##]). Three Workshops were held in October 2018 at which a Project update was presented. Chapter 2 of the EIS presents a detailed description of preliminary Project components and phases. Equinor's offshore experience globally and in offshore NL, including exploration drilling, is discussed in Chapter 1 of the EIS.***	***Section 1.1.1*** ***Section 2.6***
Engagement with Indigenous Groups	***Equinor Canada is committed to continuing to provide opportunities to Indigenous groups 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 will be developed through discussions with the various groups.***	***Section 3.3*** ***Section 18.4.1***
Economic Opportunities associated with Project	***As part of the Development Application to be submitted to C-NLOPB, Equinor Canada will prepare a Benefits Plan and an associated Gender Equity and Diversity Plan. These plans will outline economic opportunities associated with the Bay du Nord Project.***	***Not within the scope of the EIS Guidelines***

Table 3.7 Meetings and Discussions with Miawpukek First Nation (MFN)

Date	Activity	Purpose and Focus
June 13, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor
June 21, 2018	Outgoing Email	Notification of filing of BdN Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter including Project summary and map.
July 4, 2018	Outgoing Phone Call	Follow-up to letter discussing: possible meeting and next steps in engagement. MFN identified same issues of concern as those associated with the Flemish Pass Drilling Project.
July 6, 2018	Outgoing Email	Follow-up to phone call regarding potential meeting dates.
July 10, 2018	Incoming Email	Request for information session prior to meeting with Chief.
July 12, 2018	Outgoing Email	Agreement in principle to an information session but requested a call to discuss.
July 31, 2018	Outgoing Email	Request for call during week of July 20 to discuss information sharing session.
July 31, 2018	Incoming and Outgoing Emails	Email chain regarding call to discuss information sharing session. Call proposed for the week of August 6.
August 6, 2018	Outgoing Phone Call	Call with MFN to discuss holding an in-person meeting. Tentative agreement to meet on either September 12 or 13 in Gander or St. John's. Meeting will consist of a PowerPoint presentation followed by a discussion of issues and concerns. Equinor Canada to follow-up with confirmation and MFN to check internal availability and estimate costs of participation.
August 6, 2018	Outgoing Email	Email confirming substance of telephone call.
August 8, 2018	Outgoing Email	Confirmation of availability to meet on proposed dates.
August 8, 2018	Incoming Email	Proposal to meet on September 13; location to be determined.
August 8, 2018	Incoming Email	Confirmation of meeting date of September 13 in St. John's. MFN requested draft agenda. MFN to provide list of attendees and associated budget.
August 10, 2018	Incoming and Outgoing Emails	Email chain regarding logistics and details of September 13 meeting.
August 15, 2018	Outgoing Email	Commitment to contact MFN on August 27 to finalize details of meeting.
August 16, 2018	Incoming Email	Proposed budget for meeting in St. John's September 13.

August 27, 2018	Incoming and Outgoing Emails	Email chain regarding phone call to discuss meeting budget
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss BdN Project, potential effects and proposed mitigation.
August 29, 2018	Outgoing Phone Call	Discussion with MFN regarding draft budget. Equinor Canada to discuss rationale for budget internally and respond formally to Shared Value Solutions by early the next week.
September 5, 2018	Outgoing Email	Formal response to budget request from MFN.
September 5, 2018	Incoming Email	MFN response to Equinor Canada regarding budget.
September 5, 2018	Incoming Email	Requesting meeting details and proposing agenda.
September 7, 2018	Outgoing Email	Email with meeting details and response to MFN agenda proposal.
September 11, 2018	Outgoing Email	Email transmitting PowerPoint presentation and agenda for September 13 meeting.
September 13, 2018	In-Person Meeting	Delivery of PowerPoint presentation and Project overview. Discussion of issues of concern and next steps in engagement.
September 15, 2018	Outgoing Email	Follow-up to September 13 meeting.
September 20, 2018	Outgoing Email	Draft meeting notes provided for review.
September 20, 2018	Outgoing Email	Draft Engagement Plan submitted for review
September 20, 2018	Incoming and Outgoing Emails	Email chain regarding draft Engagement Plan.
October 3, 2018	Outgoing Email	Offer to fund Indigenous Knowledge study of marine species of concern by offshore operators, including Equinor Canada.
October 9, 2018	Incoming Email	Email transmitting revised meeting notes.
October 10, 2018	Outgoing Email	Regarding arrangements for external participation in half day workshop in St. John's.
October 10, 2018	Outgoing Phone Call	Regarding arrangements for call-in participation in half day workshop in St. John's.
October 10, 2018	Outgoing Email	Electronic transmission of workshop materials to MFN external participants.
October 10, 2018	Incoming Email	MFN response to October workshop materials, indicating that workshop does not constitute consultation and requesting enhanced funding for Indigenous Knowledge study.
October 11, 2018	Workshop	Half day workshop in St. John's to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 12, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments.

October 12, 2018	Incoming Email	Response to workshop materials and commitment to provide revised Engagement Plan in near future.
October 23, 2018	Incoming Email	Email transmitting revised Engagement Plan for review and comment by Equinor Canada.
October 23, 2018	Outgoing Phone Call	Discussion regarding received Engagement Plan and to seek clarification on requested TK funding. MFN clarified that funding requested would be in addition to funding requested from operators. MFN requests response by November 14.
October 29, 2018	Outgoing Email	Transmission of revised notes from September 13 meeting to MFN for review and comment.
October 30, 2018	Outgoing Email	Transmission of agreed-upon meeting notes from September 30 meeting.
October 31, 2018	Incoming Phone Call	Phone call requesting slight revision to meeting notes; an update on the status of the scholarship request (from September 13 meeting) was also requested. Equinor Canada committed to follow-up regarding status of scholarship request.
November 2, 2018	Outgoing Phone Call	To discuss scholarship request; left voicemail.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 7, 2018	Outgoing Phone Call	To discuss scholarship request; Equinor Canada was advised that Chief is out of town for the week.
November 8, 2019	Incoming Phone Call	Discussion with Chief regarding scholarship request; Equinor Canada advised that the scholarship request will be considered as part of preparation of Development Application and associated Benefits and Diversity Plans. Equinor Canada also advised the response to draft Engagement Plan would be forthcoming.
November 8, 2018	Outgoing Email	Follow up to workshop, transmitting invoicing information and requesting further comments regarding potential effects/mitigation measures.
November 9, 2018	Outgoing Email	Information regarding sea icing and the floating production, storage and offloading (FPSO) installation.
November 9, 2018	Incoming Email	Response to Equinor Canada's email regarding sea icing and the FPSO.
November 14, 2018	Incoming and Outgoing Emails	Email chain to schedule conference call regarding Equinor Canada redraft of the Engagement Plan transmitted by MFN on October 23.
November 16, 2018	Outgoing Email	Email transmitting re-draft of Engagement Plan

November 20, 2018	Outgoing Phone Call	Discussion of Equinor Canada's re-draft of Engagement Plan.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***
August 1, 2019	***Incoming and Outgoing Emails***	***Email from MFN requesting a meeting to discuss status of Project, future consultation and community investments. Equinor Canada's agreement to request.***
August 2, 2019	***Conference Call***	***Discussion of purpose of meeting and associated agenda. Meeting confirmed for August 15, 2019***
August 15, 2019	***In person Meeting***	***Meeting between representatives of MFN and Equinor Canada to discuss status of Bay du Nord and associated regulatory processes, funding, future consultation and plans associated with the Development Application - Gender Equity and Diversity Plan and Benefits Plan***
August 16, 2019	***Incoming and Outgoing Emails***	***Follow up to meeting and providing MFN with copy of presentation and associated materials***
August 27, 2019	***Outgoing Email***	***Providing MFN with copy of draft meeting notes for review and comment***
September 4, 2019	***Incoming Email***	***MFN providing proposed revision to draft meeting notes***
September 6, 2019	***Outgoing Email***	***Equinor Canada's acceptance of MFN's proposed revision***
September 19, 2019	***Outgoing Email***	***Email circulating final agreed-upon meeting notes***

Key Issues and Questions Raised	Response	EIS Reference
Equinor's Corporate Structure, Experience and Policies	***Details of Equinor's corporate structure, experience, values and policies were summarized in a power point presentation transmitted to each Indigenous group (see Appendix [XXX]) and discussed at in-person meetings. Equinor's corporate structure, experience and policies are fully described in Chapter 1 of the EIS.***	***Section 1.1***
Project Concept and Design – footprint, number of wells, oil transport, safety zone, tiebacks, spill response plan, flowlines and pipelines	***Details respecting the Project, including Project concept and design, have been provided to Indigenous groups during Equinor Canada's ongoing engagement activities. In addition, Project details were summarized in a power point presentation which was provided to each Indigenous Group and discussed at in-person meetings (see Appendix [##]). Three Workshops***	***Section 2.5***

	were held in October 2018 at which a Project update was presented. Chapter 2 of the EIS contains a detailed description of preliminary Project components, phases and activities.	
Impact on Commercial and FSC fisheries	***Through its ongoing engagement activities as well as information contained in the Indigenous Knowledge desktop study, Equinor is aware of the social, cultural, traditional and economic importance of fish and fish habitat to Indigenous groups. Information on species of either traditional or commercial importance has been incorporated into baseline information (see chapters 6 and 7). Potential effects (direct and indirect) on of the Project upon marine fish and fish habitat and commercial and subsistence fisheries and associated mitigation measures are discussed in Chapters 9, 13 and 14 respectively. These chapters conclude that no effects upon FSC subsistence fisheries from routine Project activities are predicted. While no significant effects upon commercial fish species or the commercial fisheries are predicted, proposed mitigation measures for commercial fisheries will include the following:*** • Ongoing communication with commercial fishers 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) 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 • Implementation of a standard marine communication protocol to promote safe practices between commercial fishing enterprises, other marine users and BdN operations • Issuance of Notices to Shipping and Notices to Mariners (where appropriate) regarding planned Project activities • Compensation for damage or loss in accordance with C-NLOPB Guidelines	***Section 6.1*** ***Section 7.1*** ***Section 7.3.8*** ***Section 9.4*** ***Section 13.1.5*** ***Section 13.2*** ***Section 13.4*** ***Section 13.5*** ***Section 14.1.5***
Vessel Traffic – noise and discharges and impact on salmon	***Potential environmental effects of vessel traffic (noise and discharges) upon marine fish, including salmon are identified and assessed in Chapter 9. The effects of sound were identified and assessed based on sound propagation modelling which***	***Section 9.2.4***

	included an assessment of the potential effects of vessel traffic sounds on fishes and invertebrates. Given the transitory nature of fish and the demonstrated avoidance behavior in response to sound, Equinor Canada predicts that it is unlikely that fish would remain in the vicinity of sound long enough to result in injury.	
Spills – treatment and response	***Chapter 16 provides a description of potential accidental events and assessment of potential effects of a variety of spills on valued ecological components. Equinor Canada's proposed mitigations and spill response measures are set out in Chapter 16 and additional information on Well Intervention Response Strategies and related matters is contained in Appendices [##]. Equinor Canada is prepared to effectively respond to an oil spill offshore and is equipped with the necessary response tools, personnel and strategies. A key focus is on prevention. Spill prevention will be incorporated into Project design and operations and facilities, processes and management system procedures are intended to reduce or eliminate the chance of a spill.*** ***All plans associated with a response to accidental events are submitted to the C-NLOPB for review and approval as part of the regulatory authorizations process.***	***Section 16.1***
Sound – effects on marine life	***Equinor Canada has conducted sound propagation modelling to assess the potential impacts of sound on marine life from various Project activities, including sound associated with vessel traffic. The potential effects of sound on marine fish, invertebrates, marine mammals and marine and migratory birds are identified and assessed in chapters 9, 10 and 11 respectively of the EIS. Sound monitoring during seismic surveys will be carried out. Section 18.4.2 provides information on sound monitoring.***	***Section 9.2.4*** ***Section 10.2.4*** ***Section 11.2.4*** ***Section 18.2*** ***Section 18.4.2***
Community Investment	***As part of the Development Application to be submitted to C-NLOPB, Equinor Canada will prepare a Benefits Plan and a Gender Equity and Diversity Plan. These plans will outline economic opportunities associated with the Bay du Nord Project***	**Not within the scope of the EIS**
Safety and Environment – compliance with regulatory standards	***Equinor is committed to becoming an industry leader on safety and will comply with all regulatory standards respecting worker and environmental safety, as outlined in Chapter 1 of the EIS. Relevant legislation is listed in Chapter 1 and in addition, in accordance with the Atlantic Accord Acts and Section 6 of the Newfoundland Offshore Petroleum Drilling and Production Regulations, a Safety Plan***	***Section 1.3.2.2*** ***Section 1.3.4***

	must be approved by the C-NLOPB prior to the issuance of an Operations Authorization.	
Future Indigenous Engagement	***Equinor Canada is committed to continuing to provide opportunities to Indigenous groups 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 will be developed through discussions with the various groups.***	***Section 14.1.5***
Incorporation of Indigenous Knowledge	***Equinor Canada has made every reasonable effort to collect and incorporate traditional Indigenous knowledge into the EIS. Equinor Canada has invited Indigenous groups to provide traditional knowledge during the course of engagement and has, in addition, offered to enter into agreements for the collection of Indigenous knowledge. Equinor Canada also commissioned an Indigenous Knowledge Desktop Study. Information contained in this study, together with information from other sources, was taken into account in the development of the ecosystem approach throughout the EIS and was used to identify species of interest to Indigenous groups.***	***Section 14.1.4*** ***Appendix H***
Impact of Project on Indigenous Rights	***Information regarding Indigenous rights is included in Chapters 7 and 14 of the EIS. It is Equinor Canada's understanding that none of the identified groups have asserted or established Indigenous rights to, in or near the lands and waters of the LSA, including the Core BdN Development Area and the Project Area. Additionally, none of the Indigenous groups has identified any current use of lands and resources for traditional purposes or other forms of traditional activities in the LSA. There is also no overlap between the traditional territory of any of the 41 Indigenous groups listed in the EIS Guidelines and the Core BdN Development Area, the Project Area, or the LSA. However, Equinor Canada will continue to engage with Indigenous groups to further understand if there are any potential adverse impacts to Indigenous rights.***	***Section 7.3*** ***Section 14.1.5*** ***Section 14.4.1*** ***Section 14.4.2***

Table 3.8 Meetings and Discussions with Qalipu Mi'Kmaq First Nation (QMFN) Band

Date	Activity	Purpose and Focus
June 13, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor

June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter including Project summary and map.
June 27, 2018	Outgoing Phone Call	Follow-up to discuss next steps, no answer.
June 28, 2018	Outgoing Phone Call	Follow-up to discuss structure and timing of meeting between Equinor Canada and QMFN.
July 5, 2018	Incoming Email	Discussion of timing of meeting and confirmation that no major concerns to date.
July 5, 2018	Outgoing Email	Commitment to provide information to QMFN and offer to meet in person or by phone to provide overview of Project.
July 23, 2018	Outgoing Email	Transmission of Bay du Nord PowerPoint presentation and request for phone call to discuss Indigenous Knowledge and Accord Acts
August 6, 2018	Outgoing Email	Follow-up to request phone call to discuss process for sharing Indigenous Knowledge.
August 14, 2018	Incoming and Outgoing Emails	Email chain to schedule a conference call September 5 to discuss Bay du Nord Project and the process for sharing Indigenous Knowledge.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
September 4, 2018	Incoming Email	Request to reschedule conference call from September 5 to September 7.
September 7, 2018	Conference Call	Conference call to provide Project overview, discuss integration of Indigenous Knowledge and next steps in engagement. Issues identified regarding environmental effects monitoring (EEM), cumulative effects and potential impact on marine habitat.
September 7, 2018	Outgoing Email	Follow-up to conference call confirming understanding on future engagement. Call requested to discuss Indigenous Knowledge and response to questions about species and sediment quality.
September 12, 2018	Incoming Email	QMFN confirmed engagement approach and provide contact information for business and employment managers and directors.
September 12, 2018	Outgoing Email	Confirming availability for follow-up conference call.
October 5, 2018	Incoming and Outgoing Emails	QMFN not able to attend half-day workshop on Bay du Nord Project so Equinor Canada agreed to provide workshop notes and schedule follow-up phone call.

October 12, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	Email transmitting invoicing information and inviting further comments on potential effects/proposed mitigation.
November 8, 2018	Incoming Email	Confirming accuracy of community baseline information.
November 8, 2018	Incoming Email	Providing comments on Worksheets and potential effects and proposed mitigation measures.
December 11, 2018	Outgoing Email	Email regarding following up in 2019 to discuss Accord Acts.
December 12, 2018	Incoming Email	Acknowledgement of email regarding Accord Act discussion.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	Response	EIS Reference
Environmental Effects Monitoring (scope)	***Detailed information respecting follow-up and monitoring programs is contained in Chapter 18 of the EIS. The design of follow-up monitoring programs 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. Preliminary discussions with Indigenous groups respecting proposed monitoring measures were held at three Workshops in October and Indigenous groups which did not participate in person were invited to provide comments in writing.*** ***The scope of follow-up monitoring programs will take into consideration the results of other offshore environmental effects monitoring programs (both previous and ongoing), employ technology specifically suited to the monitoring of a production project at 1200 m water depths and utilize Equinor's global experience in EEM, ongoing research and new technologies.***	***Section 18.4***

Cumulative Effects on marine ecosystem	***Equinor Canada has identified and assessed cumulative effects using the approach described in relevant CEA Agency guidance documents by considering the impact of the Project in combination with other past, present and future activities in the region upon each VC. As is the case with the assessment of intra-Project effects, an ecosystem approach will be adopted. The results of this assessment are set out in Chapter 15 of the EIS and it is Equinor Canada's conclusion that that the Project is not likely to result in any significant adverse cumulative effects upon the marine ecosystem in combination with other projects and activities that have been or will be carried out in the RSA.***	***Section 15.2.6*** ***Section 15.3.6*** ***Section 15.4.6*** ***Section 15.5.5*** ***Section 15.6.5*** ***Section 15.7.5***
Effects on species of concern (Salmon, American eel)	***Through its ongoing engagement activities as well as information contained in the Indigenous Knowledge desktop study, Equinor Canada is aware of the social, cultural, traditional and economic importance of fish and fish habitat to Indigenous groups. During its ongoing engagement, Indigenous groups have placed particular emphasis upon salmon and American eel as species of cultural importance. Information on species of either traditional or commercial importance has been incorporated into baseline information (see chapters 6 and 7). Potential effects (direct and indirect) of the Project upon marine fish and fish habitat and subsistence fisheries and associated mitigation measures are discussed in Chapters 9 and 14 respectively. These chapters predict that no significant direct effects upon marine fish or fish habitat or any indirect effects (cultural, social, health or socio-economic) upon Indigenous persons are predicted to result from routine Project activities. The effect of accidents and malfunctions upon marine fish and fish habitat and Indigenous persons are discussed in Chapter 16.***	***Section 6.1.9.2*** ***Section 6.1.9.6*** ***Section 7.3.8.2*** ***Section 9.4*** ***Section 14.1.5***
Lack of capacity - funding	***Questions associated with provision of capacity funding to Indigenous groups to participate in the environmental assessment process have been referred to the CEA Agency***	***Not within the scope of the EIS***
Project design and components	***Details respecting the Project, including Project concept and design, have been provided to Indigenous groups during Equinor Canada's ongoing engagement activities. In addition, Project details were summarized in a power point presentation which was provided to each Indigenous Group and discussed at in-person meetings (see Appendix [##]). Three Workshops were held in October 2018 at which a Project update was presented. Chapter 2 of the EIS***	***Chapter 1.2*** ***Appendix A.3***

	presents a detailed description of preliminary Project design and components.	

Table 3.9 Meetings and Discussions with Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO)

Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO): Aggregate body representing the Assembly of Nova Scotia Mi'kmaq Chiefs (ANSMC) representing: Acadia First Nation, Annapolis Valley First Nation, Bear River First Nation, Eskasoni First Nation, Glooscap First Nation, Membertou First Nation, Paqtnkek Mi'kmaw Nation, Pictou Landing First Nation, Potlotek First Nation, Wagmatcook First Nation, and Waycobah First Nation. For all engagement with KMKNO, Equinor Canada understands that KMKNO is acting on behalf of the groups listed here. Key Issues and Questions raised communicated by KMKNO rather than constituent member communities. *Correspondence is with KMKNO unless indicated otherwise.* Millbrook First Nation and Sipekne'katik First Nation pursue consultation and negotiation independently of KMKNO.

Date	Activity	Purpose and Focus
June 14, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Incoming Letter	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Acadia First Nation	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Annapolis Valley First Nation	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Bear River First Nation	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Eskasoni First Nation	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Glooscap First Nation	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Membertou First Nation	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Paqtnkek First Nation	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Pictou Landing First Nation	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Potlotek First Nation	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Wagmatcook First Nation	Project Description notification letter, Project summary and map.
June 25, 2018	Outgoing Letter to Waycobah First Nation	Project Description notification letter, Project summary and map.
June 27, 2018	Outgoing Email	Follow-up to Project Description letter to discuss next steps.

July 4, 2018	Incoming Email	Requesting possible meeting dates.
July 4, 2018	Outgoing Email	Proposing phone call to discuss meeting dates and logistics.
July 4, 2018	Incoming Email	Confirmation of phone call on July 10.
July 10, 2018	Outgoing Phone Call	To discuss timing of an in-person meeting, including with fisheries coordinator.
July 10, 2018	Outgoing Email	Follow-up email to phone call committing to provide possible dates for an in-person meeting in July.
July 13, 2018	Incoming and Outgoing Emails	Discussion of potential meeting dates in late July as mutually convenient.
July 17, 2018	Outgoing Email	Proposal to meet on July 24 in Truro.
July 18, 2018	Incoming and Outgoing Emails	Confirming meeting time and location and providing call-in information.
July 23, 2018	Outgoing Email	Transmission of PowerPoint in advance of in-person meeting.
July 24, 2018	In-Person Meeting	Delivery of PowerPoint presentation and Project overview. Discussion of issues of concern and next steps in engagement.
July 25, 2018	Outgoing Email	Email providing KMKNO with requested information and agreement by Equinor Canada to develop a draft Engagement Plan.
August 8, 2018	Incoming and Outgoing Emails	Transmission of draft Engagement Plan.
August 15, 2018	Outgoing Email	KMKNO confirms receipt of Engagement Plan and indicates that will respond by end of August.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
September 20, 2018	Outgoing Email	Proposing phone call to discuss draft Engagement Plan.
September 20 to 28, 2018	Incoming and Outgoing Emails	Email chain regarding call to discuss Engagement Plan.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments. Equinor Canada offered to schedule a conference call to discuss and committed to providing KMKNO with a copy of the final Workshop Report.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	Email transmitting invoicing materials and asking for any further comments on potential effects/proposed mitigation.
November 8, 2018	Incoming and Outgoing Emails	Email chain acknowledging receipt of invoicing materials. Offer by Equinor Canada to hold call

		with new consultation representative to provide background on community engagement to date.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	Response	EIS Reference
Environmental Effects Monitoring – form, scope and frequency	***Detailed information respecting follow-up and monitoring programs is contained in Chapter 18 of the EIS. The design of follow-up monitoring programs 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. Preliminary discussions with Indigenous groups respecting proposed monitoring measures were held at three Workshops in October and Indigenous groups which did not participate in person were invited to provide comments in writing.*** ***The scope of such programs will take into consideration the results of other offshore environmental effects monitoring programs (both previous and ongoing), employ technology specifically suited to the monitoring of a production project at 1200 m water depths and utilize Equinor's global experience in EEM, ongoing research and new technologies.***	***Section 18.4***
Cumulative Effects	***Equinor Canada has identified and assessed cumulative effects using the approach described in relevant CEA Agency guidance documents by considering the impact of the Project in combination with other past, present and future activities in the region upon each VC. As is the case with the assessment of intra-Project effects, an ecosystem approach has been adopted. The results of this assessment are set out in Chapter 15 of the EIS and it is Equinor Canada's prediction that that the Project is not likely to result in any significant adverse cumulative effects upon the marine ecosystem or upon human uses within that ecosystem in combination with other projects and activities that have been or will be carried out in the RSA.***	***Section 15.2.6*** ***Section 15.3.6*** ***Section 15.4.6*** ***Section 15.5.5*** ***Section 15.6.5*** ***Section 15.7.5***

Scale of offshore operations in Norway vs. NL	***During an in-person meeting with KMKNO, Equinor Canada provided KMKNO with a graphic illustrating the relative intensity of oil and gas operations in offshore Norway and the North Sea in comparison with current activities in offshore NL. Details respecting Equinor and Equinor Canada's corporate structure, policies, values and global offshore experience have been provided to Indigenous groups during Equinor Canada's ongoing engagement activities. In addition, corporate details were summarized in a power point presentation which was provided to each Indigenous Group and discussed at in-person meetings (see Appendix [##]). Equinor's offshore experience is described in Chapter 1 of the EIS.***	***Section 1.1*** ***Appendix ##***
Environmental Effects – Ballast water and introduction of invasive species through ballast water	***Equinor Canada considers prevention to be key in controlling the introduction and spread of aquatic invasive species. Although the likelihood that a Project vessel will result in the introduction and spread of an invasive species is relatively low, ballast water will be managed in consideration of applicable Canadian and international ballast water management requirements to reduce the potential spread of invasive species. Ballast water management is addressed in Chapter 2 and potential effects are discussed in Chapter 9.***	***Section 2.8.2*** ***Section 9.2.4.1*** ***Section 9.5.2***
Decommissioning – removal of seabed infrastructure and impact on habitat	***As stated in Section 9.2.6.2 of the EIS, there are two options for decommissioning of subsea infrastructure – leave the infrastructure in place or removal of the infrastructure. The effects of each alternative are described and assessed in Section 9.2.6.2 of the EIS.***	***Section 9.2.6.2***
Spills – effects on biophysical environment and human health	***Equinor Canada has conducted spill modelling, using a worst-case scenario (unmitigated blow-out). The potential effects of spills on the biophysical environment and human health are discussed in Chapter 16.***	***Section 15.5.6.2*** ***Section 16.7***
Communal Commercial Fisheries, including effects on commercial species (snow crab) and compensation for losses	***Current communal commercial fishing activities are described in Chapter 7 and the potential effects of the Project upon communal commercial fisheries is discussed in Chapter 13. No significant impacts upon communal commercial fisheries, including snow crab fisheries, are predicted. Equinor Canada will develop and implement a compensation program for damages experienced by commercial and communal commercial fishers which result from Project activities. The program will be developed in consideration of the C-NLOPB Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activities (2017). The***	***Section 7.3.8.1*** ***Section 13.1.5.1*** ***Section 13.4.2*** ***Section 14.1.5.2*** ***Section 16.7.8***

	proposed compensation regime is discussed in greater detail in Chapters 13 and 16.	
Ongoing information sharing with Indigenous groups	***Equinor Canada is committed to continuing to provide opportunities to Indigenous groups for information-sharing and exchange as requested or required in the post-EIS period in order to discuss issues and concerns. The specifics of engagement processes will be developed through discussions with the various groups.***	***Section 14.1.5***

Table 3.10 Meetings and Discussions with Millbrook First Nation

Date	Activity	Purpose and Focus
June 14, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor.
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter, Project summary and map
July 18, 2018	Outgoing Phone Call	Follow-up phone call. No answer and voicemail not available. Sent follow-up email requesting call.
July 23, 2018	Incoming and Outgoing Emails	Email chain regarding scheduling of call to discuss next steps in engagement on Bay du Nord.
August 10, 2018	Outgoing Phone Call	Phone call to discuss next steps in engagement No answer.
August 10, 2018	Outgoing Email	Email reiterating Equinor Canada's interest in engaging with Millbrook and offering to schedule a conference call.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
September 20, 2018	Outgoing Email	Email transmitting PowerPoint presentation and proposing a conference call. No response.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments. Equinor Canada offered to schedule a conference call to discuss and committed to providing Millbrook with a copy of the final workshop report. ***No response received.***
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	E-mail transmitting invoicing materials and inviting additional comments on potential effects/proposed mitigation measures.

December 14, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***
Key Issues and Questions Raised		***Where Addressed in EIS***
None identified to Proponent		***n/a***

Table 3.11 Meetings and Discussions with Sipekne'katik First Nation

Date	Activity	Purpose and Focus
June 14, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor.
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter, Project summary and map.
July 18, 2018	Outgoing Phone Call	Number not in service. Sent email requesting new contact information.
July 18, 2018	Outgoing Email	Email requesting a phone call to discuss next steps in engagement.
July 23, 2018	Incoming and Outgoing Emails	Email chain regarding scheduling a phone call to discuss the Bay du Nord Project and engagement
July 31, 2018	Outgoing Email	Request to schedule a phone call the week of July 30 or August 6, 2018.
August 10, 2018	Outgoing Email	Email regarding release of EIS Guidelines and proposing a conference call the week of September 3.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
September 20, 2018	Outgoing Email	Transmission of PowerPoint presentation and proposal for a conference call.
October 19, 2018	Workshop	Half day workshop in Moncton to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments. Equinor Canada offered to schedule a conference call to discuss and committed to providing Sipekne'katik with a copy of the final workshop report. ***No response received.***
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.

November 8, 2018	Outgoing Email	Email inviting additional comments on potential environmental effects/proposed mitigation measures.
November 13, 2018	Incoming and Outgoing Emails	Email chain regarding review of worksheets from the Moncton workshop.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***
April 30, 2019	***Outgoing Email***	***Email to new consultation contact, advising of status of Bay du Nord Project EA and offering to discuss by phone. No response***
Key Issues and Questions Raised		**Where Addressed in EIS**
None identified to Proponent		**n/a**

Table 3.12 Meetings and Discussions with Mi'gmawe'l Tplu'taqnn Inc. (MTI)

Mi'gmawe'l Tplu'taqnn Inc. (MTI): *Aggregate body for Fort Folly First Nation, Eel Ground First Nation, Pabineau First Nation, Esgenoôpetitj First Nation, Buctouche First Nation, Indian Island First Nation, Eel River Bar First Nation, Metepnagiag Mi'kmaq First Nation regarding engagement. For any engagement with MTI, Equinor Canada understands that MTI is acting on behalf of these groups. Key Issues and Questions Raised are those identified by MTI and not by member communities.* ***Correspondence is with MTI unless indicated otherwise****. Elsipogtog First Nation is not represented by MTI and is engaged directly through Kopit Lodge.*

Date	Activity	Purpose and Focus
June 14, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter, including Project summary and map.
June 27, 2018	Outgoing Email	Request to schedule a follow-up phone call on June 28.
June 25, 2018	Outgoing Letter to Buctouche First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Eel Ground First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Eel River Bar First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Esgenoôpetitj First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Fort Folly First Nation	Project Description notification letter, including Project summary and map.

June 25, 2018	Outgoing Letter to Indian Island First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Metepenagiag First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Pabineau First Nation	Project Description notification letter, including Project summary and map.
June 28, 2018	Conference Call	Phone call to discuss next steps in engagement and possible dates/subject matter for meeting with MTI representatives.
June 28, 2018	Outgoing Email	Review of issues raised during conference call and confirmation of a follow-up call by July 5.
June 28, 2018	Incoming Email	Confirming intent to provide possible meeting dates and issues to discuss by July 5.
July 6, 2018	Incoming and Outgoing Emails	Email chain regarding possible dates for meeting. Phone call scheduled for July 10 to determine meeting date and issues to be discussed.
July 10, 2018	Outgoing Phone Call	Discussion of potential meeting dates and meeting agenda.
July 10, 2018	Outgoing Email	Email confirming July 19 meeting date and request for call to discuss details.
July 11 – July 13, 2018	Incoming and Outgoing Emails	Email chain confirming conference call on July 13, meeting agenda, location, participants and other details.
July 19, 2018	In-Person Meeting	Delivery of PowerPoint presentation and Project overview. Discussion of issues of concern and next steps in engagement.
July 23, 2018	Outgoing Email	Follow up to meeting and request for phone call to discuss next steps.
July 30, 2018	Incoming and Outgoing Emails	Email chain regarding call on August 2.
August 2, 2018	Phone Call	Follow-up to meeting to Project update, identify matters for information exchange and discuss engagement process. Agreement to hold monthly calls.
August 2, 2018	Incoming Email	Transmission of meeting notes.
August 2, 2018	Outgoing Email	Transmission of meeting notes and examples of Indigenous Knowledge studies
August 7, 2018	Outgoing Email	Email providing information about Sami and Salmon, as requested at July 19 meeting.
August 14, 2018	Incoming Email	Email providing copy of Indigenous Knowledge Study prepared for Exploration Drilling Program.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
September 6, 2018	Conference Call	Monthly call to provide status report on Project and related matters. Parties discussed the

		desktop Indigenous Knowledge Study, EIS Guideline comment period, and October workshop.
October 4, 2018	Conference Call	Second monthly call to provide status report on Project and related matters. Parties discuss draft Project EIS Guidelines, Participant Funding Program, and upcoming workshop.
October 19, 2018	Workshop	Half day workshop in Moncton to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments.
November 1, 2019	Conference Call	Third monthly project update call, as per agreement. Parties discussed workshop, time to provide additional comments, and compilation of Indigenous community baseline information. MTI will resend workshop worksheets to Fisheries Director for review and comment and will check baseline information for accuracy. December monthly call to be rescheduled for second week in December. Revised invitation for December call sent out on November 2.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	Email transmitting invoicing information and inviting further comments on potential environmental effects/proposed mitigation.
December 10, 2018	Outgoing Phone Call	Monthly update phone call. Discussed topics such as status of EIS and workshop report. No issues identified by MTI.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report which is included in Appendix G.
January 3, 2019	***Outgoing Email***	***Scheduling of Project update call***
January 15, 2019	***Conference Call***	***Project update discussion and capacity funding***
January 24, 2019	***Incoming and Outgoing Emails***	***Discussion of request for capacity funding***
January 25, 2019	***Conference Call***	***Call to discuss funding request. MTI asked to provide list of ongoing community initiatives. Parties agree that monthly calls not necessary while EA ongoing. Calls on an as-needed basis. No list of community initiatives subsequently provided.***
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	Response	EIS Reference
Marine Protected Areas and potential interaction with the Project	***Marine Protected Areas and other Special Areas in the RSA are described in Chapter 6. The potential effects of the Project upon Special Areas are identified and assessed in Chapters 12 and 16.***	***Section 6.4*** ***Section 12.2*** ***Section 16.7.7***
Marine Mammals – potential impacts on right whales, with emphasis on ship strikes	***The potential impacts of the Project upon marine mammals, including right whales, are identified and assessed in Chapter 11. It is the opinion of Equinor Canada that the likelihood of ship strikes of right whales is low due to the projected low volume and frequency of Project-related vessel traffic. Furthermore, the vessel traffic corridor is not within specific areas that have been identified as marine mammal breeding grounds, feeding concentrations, and/or migration routes 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. While it is highly unlikely that surface active groups of North Atlantic right whales will occur along the vessel traffic route to the Project Area, if oneis detected by Project vessel crew, the sighting(s) will be reported immediately to DFO.***	***Section 11.2.4*** ***Section 11.4.2***
Fish and Fish Habitat – potential impact on salmon migrating through/overwintering in Project Area	***As a result of its ongoing engagement activities, including the Indigenous Knowledge Desktop Study, Equinor Canada is aware of the traditional, social and cultural importance of salmon to Indigenous groups. Equinor Canada has identified and assessed the potential impacts of the Project upon the various Atlantic salmon populations, including those which may migrate through or overwinter in the Project Area. As stated in the EIS, it is Equinor Canada's conclusion that the potential for interactions with the relevant salmon populations and the Project is limited. While the Project may result in limited localized interactions with individual salmon, it is not predicted to have overall ecological or population-level effects and will not result in a detectable decline in overall abundance or changes in the spatial and temporal distribution of salmon populations in the area. Baseline information on various salmon populations is contained in Chapter 6 and the potential effects of the Project upon these populations is identified and assessed in Chapter 9. Effects of accidents and spills upon marine fish and fish habitat, including salmon are discussed in Chapter 16. The cultural and traditional significance of salmon to Indigenous peoples is***	***Section 6.1.9.6*** ***Section 7.3.8.2*** ***Section 9.4*** ***Section 14.1.5*** ***Section 16.7.4.1***

	described in Chapter 7 and potential indirect effects upon Indigenous peoples resulting from direct effects to salmon are identified and assessed in Chapter 14.	
Environmental Effects Monitoring – scope and nature	***Detailed information respecting follow-up and monitoring programs is contained in Chapter 18 of the EIS. The design of follow-up monitoring programs 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. Preliminary discussions with Indigenous groups respecting proposed monitoring measures were held at 3 Workshops in October and Indigenous groups which did not participate in person were invited to provide comments in writing.*** ***The scope of such programs will take into consideration the results of other offshore environmental effects monitoring programs (both previous and ongoing), employ technology specifically suited to the monitoring of a production project at 1200 m water depths and utilize Equinor's global experience in EEM, ongoing research and new technologies.***	***Section 18.4***
Indigenous Engagement	***Equinor Canada is committed to continuing to provide opportunities to Indigenous groups for information-sharing and exchange as requested or required in the post-EIS period in order to discuss issues and concerns. The specifics of engagement processes will be developed through discussions with the various groups.***	***Section 14.1.5***
Decommissioning – seabed infrastructure	***As stated in Section 9.2.6.2 of the EIS, there are two options for decommissioning of subsea infrastructure – leave the infrastructure in place or removal of the infrastructure. The effects of each alternative are described in Section 9.2.6.2 of the EIS.***	***Section 9.2.6.2***
Effects of Environment on Project – disconnection in rough weather	***In accordance with the Newfoundland Offshore Certificate of Fitness Regulations, the FPSO and drilling installation(s) are required to have a Certificate of Fitness, which requires that the installation be designed with potential environmental loads imposed by earthquakes and other naturally occurring phenomena being taken into account. The FPSO and/or drilling installation(s) are capable of disconnection in a short period of time, if necessary. Effects of the***	***Section 17.3.1***

	environment on the Project are assessed in Chapter 17.	
Produced Water – level of hydrocarbons and dispersion area	***Equinor Canada has modelled the dispersion of produced water and the identification and assessment of effects is contained in chapter 9. Appendix [##] provides the complete produced water modelling report. Modelling was based upon a worst-case scenario (produced water with a residual oil-in-water content of 30 mg/l). 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. Using the results of the modelling, the ZOI for produced water would be confined to within 100 m of the location of the FPSO.***	***Section 9.2.2.2*** ***Section 9.5.1*** ***Appendix J***
Emergency Response – budget, procedures, minimum requirements	***Equinor is committed to becoming an industry leader on safety and will comply with all regulatory standards respecting worker and environmental safety, as outlined in Chapter 1 of the EIS. Relevant legislation is listed in Chapter 1 and in addition, in accordance with the Atlantic Accord Acts and Section 6 of the Newfoundland Offshore Petroleum Drilling and Production Regulations, a Safety Plan must be approved by the C-NLOPB prior to the issuance of an Operations Authorization. Equinor Canada's spill response measures are set out in Chapter 16 and additional information on Well Intervention Response Strategies and related matters is set out in Appendices XXX. Equinor Canada is prepared to effectively respond to an oil spill offshore and is equipped with the necessary response tools, personnel and strategies. All plans surrounding a response to accidental events are submitted to the C-NLOPB for review and approval as part of the regulatory authorizations process. Financial requirements for operators respecting liability for damages attributable to the Project are governed by Regulations passed pursuant to the Atlantic Accord Acts and the Guidelines Respecting Financial Requirements (C-NLOPB 2017).***	***Section 1.3*** ***Section 16.1*** ***Appendix N*** ***Appendix O***
Indigenous groups – Sami in Norway and role in management of salmon resources	***Equinor Canada supplied MTI with relevant articles respecting the role of Sami in Norway in relation to the management of salmon resources.***	***Not within the scope of the EIS Guidelines***

Table 3.13 Meetings and Discussions with Elsipogtog First Nation

Date	Activity	Purpose and Focus

June 14, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor.
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter, including Project summary and map.
July 18, 2018	Outgoing Phone Call	Follow up to Project Description correspondence and discussion of next steps. Elsipogtog requested that a formal letter, regarding next steps, be sent to Kopit Lodge for consideration at a weekly meeting. Elsipogtog will provide Equinor Canada with a copy of the consultation protocol.
July 18, 2018	Outgoing Letter	As per request, letter to Kopit Lodge requesting consideration of the next steps in engagement process.
July 18, 2018	Incoming Letter	Letter containing consultation protocols and agreeing to next steps.
July 23, 2018	Outgoing Email	Email confirming interest in meetings and commitment to requested meeting costs.
July 25, 2018	Incoming Email	Kopit Lodge to provide possible meeting dates following internal meetings on July 30.
July 31, 2018	Outgoing Email	Email proposing a meeting in Elsipogtog on September 2 or 3.
July 31, 2018	Incoming Email	Kopit Lodge indicated it is not available to meet until the end of September.
July 31, 2018	Outgoing Email	Equinor Canada confirmed availability to meet at the end of September.
August 24, 2018	Incoming Email	Regarding potential meeting dates.
August 27, 2018	Outgoing Email	Email proposing to meet during the week of September 24 or later.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
August 27, 2018	Incoming and Outgoing Emails	Email regarding potential meeting dates in September and participation in October workshops.
August 28, 2018	Incoming and Outgoing Emails	Email chain regarding proposal to meet on September 24.
September 11, 2018	Incoming and Outgoing Emails	Email chain regarding phone call to discuss timing, agenda and structure of September 24 meeting.
September 12, 2018	Outgoing Phone Call	To confirm meeting date, time, location and content.
September 13, 2018	Outgoing Email	Transmission of reimbursement instructions.
September 19, 2018	Incoming and Outgoing Emails	Email chain regarding meeting details

September 20, 2018	Outgoing Email	Transmission of meeting agenda and PowerPoint presentation.
September 24, 2018	In-Person Meeting	Meeting to provide overview of Bay du Nord Project and discuss next steps. Discussion included capacity funding, engagement, salmon, American eel, monitoring, cumulative effects, spills and spill response.
September 25, 2018	Incoming Email	Follow-up email acknowledging meeting and expressing intention to continue information sharing.
September 26, 2018	Outgoing Email	Follow-up email expressing commitment to continued information sharing.
October 19, 2018	Workshop	Half day workshop in Moncton to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments.
October 22, 2018	Incoming Email	Email thanking Equinor Canada for information.
October 22, 2018	Incoming Email	Email stating that while the workshop was informative, it is not to be considered consultation.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	E-mail inviting additional comments on potential environmental effects/proposed mitigation measures. ***No further comments received***
December 14, 2018	Outgoing Email	Transmission of the Workshop Report which is included in Appendix G.
April 1, 2019	***Incoming Letter***	***Requesting information on new exploration licences***
April 8, 2019	***Outgoing Email***	***Clarification on new licences and EA***
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	***Response***	***EIS Reference***
Decommissioning – monitoring of abandoned wells	***Decommissioning is discussed in depth in Chapter 2. Well abandonment will adhere to the requirements set out under the Newfoundland Offshore Petroleum Drilling and Production Regulations. Pursuant to these regulations, operators are required to provide detailed plans for monitoring suspended wells to the C-NLOPB. Operators are also required to provide C-NLOPB with information regarding suspension or abandonment methods designed to ensure the wells are adequately isolated, which in turn will***	***Section 2.1.1*** ***Section 2.6.7***

	prevent hydrocarbons from entering the environment. Financial requirements for operators respecting liability for damages attributable to the Project are governed by Regulations passed pursuant to the Atlantic Accord Acts and the Guidelines Respecting Financial Requirements (C-NLOPB 2017).	
Indigenous Engagement – form, activities, funding	***Equinor Canada is committed to continuing to provide opportunities to Indigenous groups for information-sharing and exchange as requested or required in the post-EIS period in order to discuss issues and concerns. The specifics of engagement processes will be developed through discussions with the various groups. Questions respecting capacity funding to participate in the EA process have been referred to the CEA Agency.***	***Section 14.1.5***
Cumulative Effects – Impacts on traditional territory	***Equinor Canada has identified and assessed cumulative effects using the approach described in relevant CEA Agency guidance documents by considering the impact of the Project in combination with other past, present and future activities in the region upon each VC. As is the case with the assessment of intra-Project effects, an ecosystem approach has been adopted. The results of this assessment are set out in Chapter 15 of the EIS. With respect to potential impacts on traditional territories, since the closest Indigenous community is located approximately 630 km from the Project area and since there is no overlap between the Project Area or LSA with the traditional territory of any Indigenous group, no cumulative effects on traditional territories are predicted.***	***Section 15.2.6*** ***Section 15.3.6*** ***Section 15.4.6*** ***Section 15.5.5*** ***Section 15.6.5*** ***Section 15.7.5***
Species of concern – Salmon, American eel	***Through its ongoing engagement activities as well as information contained in the Indigenous Knowledge desktop study (Appendix [##]), Equinor Canada is aware of the social, cultural, traditional and economic importance of fish and fish habitat to Indigenous groups. During its ongoing engagement, Indigenous groups have placed particular emphasis upon salmon and American eel as species of cultural importance. Information on species of either traditional or commercial importance has been incorporated into baseline information (see chapters 6 and 7). Potential effects (direct and indirect) of the Project upon fish and fish habitat and subsistence fisheries and associated mitigation measures are discussed in Chapters 9 and 14 respectively. As indicated in these chapters, no significant direct effects upon marine fish or fish habitat are predicted to result from routine Project operations***	***Section 6.1.9.2*** ***Section 6.1.9.6*** ***Section 7.3.8.2*** ***Section 9.4*** ***Section 14.1.5*** ***Section 16.7.4*** ***Appendix H***

	and no indirect effects (health, cultural or socio-economic) associated with Indigenous uses or culture are predicted to result from routine Project activities. The effect of spills on fish, fish habitat and Indigenous persons are discussed in Chapter 16.	
Indigenous Rights	***Information respecting Indigenous and treaty rights is included in Chapter 7 of the EIS. It is Equinor Canada's understanding that none of the Indigenous groups listed in the EIS Guidelines have asserted or established Indigenous rights to, in or near the lands and waters of the LSA, including the Core BdN Development Area and the Project Area. Additionally, none of the Indigenous groups has identified any current use of lands and resources for traditional purposes or other forms of traditional activities in the LSA. There is also no overlap between the traditional territory of any of the 41 Indigenous groups listed in the EIS Guidelines and the Core BdN Development Area, the Project Area, or the LSA. However, Equinor Canada will continue to engage with Indigenous groups to further understand if there are any potential adverse impacts upon Indigenous rights.***	***Section 7.3***

Table 3.14 Meetings and Discussions with Wolastoqey Nation of New Brunswick (WNNB)

Wolastoqey Nation of New Brunswick (WNNB): Aggregate body for Kingsclear First Nation, Madawaska Maliseet First Nation, Oromocto First Nation, Saint Mary's First Nation, and *Tobique First Nation regarding engagement. Key Issues and Questions Raised are those identified through engagement with WNNB and not by constituent member communities.* ***Correspondence is with WNNB unless indicated otherwise****.*		
Date	**Activity**	**Purpose and Focus**
June 14, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor.
June 14, 2018	Outgoing Email to Kingsclear First Nation	Introduction of Equinor Canada's Sustainability Advisor.
June 14, 2018	Outgoing Email to Madawaska Maliseet First Nation	Introduction of Equinor Canada's Sustainability Advisor
June 14, 2018	Outgoing Email to Oromocto First Nation	Introduction of Equinor Canada's Sustainability Advisor
June 14, 2018	Outgoing Email to Saint Mary's First Nation	Introduction of Equinor Canada's Sustainability Advisor
June 14, 2018	Outgoing Email to Tobique First Nation	Introduction of Equinor Canada's Sustainability Advisor.
June 18, 2018	Incoming e-mail from Kingsclear First Nation	Response to introduction email.
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.

June 21, 2018	Outgoing Email to Kingsclear First Nation	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 21, 2018	Outgoing Email to Madawaska Maliseet First Nation	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 21, 2018	Outgoing Email to Oromocto First Nation	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 21, 2018	Outgoing Email to Saint Mary's First Nation	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 21, 2018	Outgoing Email to Tobique First Nation	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter to Kingsclear First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Madawaska Maliseet First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Oromocto First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Saint Mary's First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Tobique First Nation	Project Description notification letter, including Project summary and map.
July 10, 2018	Outgoing Email	Email requesting a phone call to discuss possible meeting with all Resource Development Consultation Coordinators (RDCCs) in a single location.
July 10, 2018	Incoming Email	Response to meeting request, including material regarding WNNB consultation protocol.
July 10, 2018	Outgoing Email	Confirming receipt of email and availability to speak with consultation coordinator.
July 10, 2018	Incoming Email	Requesting call with Equinor Canada on July 16.
July 10, 2018	Outgoing Phone Call to Kingsclear First Nation	Call to discuss next steps in engagement. No answer, left message.
July 10, 2018	Outgoing Phone Call to Madawaska Maliseet First Nation	Parties discussed Project. No serious issues but Madawaska Maliseet First Nation identified possible interactions with an Aboriginal Right (salmon using Flemish Pass as a feeding ground) and expressed interest in discussing mitigation measures and economic opportunities. ***[all subsequent engagement conducted through WNNB]***
July 16, 2018	Conference Call	Discussion of approach to engagement with WNNB member communities and proposal to meet in central location on July 24. Commitment that Equinor Canada will continue to provide relevant information.

July 16, 2018	Outgoing Email	Email confirming substance of conference call and providing links to information requested by WNNB.
July 30, 2018	Incoming Email	Proposing an in-person meeting on August 30 in Fredericton.
July 30, 2018	Outgoing Email	Confirming availability to meet on August 30.
July 30, 2018	Incoming Email	Email regarding costs of meeting and of travel to meeting by RDCCs.
August 8, 2018	Outgoing Email	Confirmation of meeting time and location and draft agenda.
August 10, 2018	Outgoing Email	Request for number of call-in participants.
August 13, 2018	Incoming and Outgoing Emails	E-mail chain confirming agenda, meeting details and participants. Confirmation of agenda and participants.
August 14, 2018	Outgoing Email	Transmission of information regarding reimbursement procedures.
August 16, 2018	Outgoing Email	Transmission of PowerPoint presentation and draft agenda for August 30 meeting.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
August 30, 2018	In-Person Meeting	Delivery of power point presentation and discussion of issues of concern and next steps in engagement.
September 5, 2018	Outgoing Email	Follow up to meeting and confirming next steps in engagement.
September 10, 2018	Outgoing Email	Requested information from WNNB on any salmon studies demonstrating that salmon feed in the Project Area.
September 10, 2018	Incoming Email	Response from WNNB including reference to salmon study.
October 19, 2018	Workshop	Half day workshop in Moncton to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	Email inviting additional comments on potential environmental effects and proposed mitigation measures.
November 15, 2018	Incoming and Outgoing Emails	Email chain regarding timing to provide revised baseline information.
November 22, 2018	Incoming Email	Transmission of edits to EIS baseline descriptions and cover letter.

December 14, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.	
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***	
Key Issues and Questions Raised	***Response***		***EIS Reference***
Commercial Fisheries – compensation for gear damage	***Equinor Canada will develop and implement a compensation program for damages experienced by commercial and communal commercial fishers which result from Project activities. The program will be developed in consideration of the C-NLOPB Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activities (2017). The proposed compensation regime is discussed in greater detail in Chapters 13 and 16.***		***Section 7.3.8.1*** ***Section 13.1.5.1*** ***Section 13.4.2*** ***Section 16.7.8***
Fish and Fish Habitat – impact on salmon from routine operations and accidents	***Through its ongoing engagement activities as well as information contained in the Indigenous Knowledge desktop study, Equinor Canada is aware of the social, cultural, traditional and economic importance of fish and fish habitat to Indigenous groups. During its ongoing engagement, Indigenous groups have placed particular emphasis upon salmon and American eel as species of cultural importance. Information on species of either traditional or commercial importance has been incorporated into baseline information (see chapters 6 and 7). Potential effects (direct and indirect) of the Project upon marine fish and fish habitat and subsistence fisheries and associated mitigation measures are discussed in Chapters 9 and 14 respectively. As indicated in these chapters, no significant direct effects upon marine fish or fish habitat or any indirect effects (cultural, social, health or socio-economic) upon Indigenous persons are predicted to result from routine Project activities. The effect of accidents and malfunctions upon marine fish and fish habitat and Indigenous persons are discussed in Chapter 16.***		***Section 6.1.9.2*** ***Section 6.1.9.6*** ***Section 7.3.8.2*** ***Section 9.4*** ***Section 14.1.5*** ***Section 16.7.4*** ***Appendix H***
Company and Operations	***Details respecting Equinor's corporate structure, experience, values and policies have been provided to Indigenous groups during ongoing engagement activities, including in a power point presentation which was transmitted to each Indigenous group and discussed at in-person meetings. Equinor Canada and its operations are fully discussed in Chapter 1 of the EIS.***		***Section 1.1***

Effect of Environment on the Project - icebergs	***Chapter 17 identifies and assesses potential effects of the Environment upon the Project, including icing and icebergs. Equinor Canada will monitor installations for icing conditions and accumulation rates, as applicable. Measures to reduce icing include removal and/or melting of the ice. Equinor Canada will implement an ice management plan, which will outline ice and iceberg observations, and protocols for disconnection of the FPSO. Equinor Canada is evaluating options for iceberg detection, such as ice detection radar and use of satellite imaging data. The FPSO will be ice-strengthened and vessels and shuttle tankers will be capable of operating in ice-prone waters.***	***Section 17.2.3*** ***Section 17.3.3***
Project Description – Equinor's offshore operations, number of wells, annual production levels	***Details respecting Equinor's offshore operations (international and Canadian) have been provided to Indigenous groups during ongoing engagement activities, including in a power point presentation (see Appendix [##]) which was transmitted to each Indigenous group and delivered at in-person meetings. Equinor Canada's offshore operations are described in Chapter 1.***	***Chapter 1.1.1*** ***Appendix ##***
Environmental Effects Monitoring	***Detailed information respecting follow-up and monitoring programs is contained in Chapter 18 of the EIS. The design of follow-up monitoring programs 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. Preliminary discussions with Indigenous groups respecting proposed monitoring measures were held at three Workshops in October and Indigenous groups which did not participate in person were invited to provide comments in writing.*** ***The scope of such programs will take into consideration the results of other offshore environmental effects monitoring programs (both previous and ongoing), employ technology specifically suited to the monitoring of a production project at 1200 m water depths and utilize Equinor Canada's global experience in EEM, ongoing research and new technologies.***	***Section 18.4***
Produced Water and treatment of radioactive materials	***Equinor Canada will treat produced water as well as other discharges using best treatment practices that are commercially available and***	***Section 2.7.1.5***

	economically feasible. A description of the proposed treatment package for produced water is provided in Section 2.7.1.5 of the EIS. All discharges will be in accordance with applicable regulatory requirements and the OWTG. Equinor Canada's EPP will include plans for the management of waste materials generated during the Project (both hazardous and non-hazardous materials), such as oily wastes, waste chemicals and containers, domestic wastes etc. All wastes will be managed in accordance with the OWTG. The occurrence of naturally occurring radioactive material (NORM) in volumes of waste of any significance is not anticipated. If radioactive material is encountered, appropriate waste handling and management will be implemented. Waste treatment is discussed in Chapter 2.	
Sedimentation – impact on habitat, corals and sponges	***Equinor Canada conducted a coral and sponge survey of the Core BdN Area in 2018. This survey is described in Chapter 6 which provides an overview of the existing biological environment within the Project and study areas, including background information on factors that may influence sponge distribution including sedimentation. Potential effects of suspended sediments and sedimentation upon the benthic habitat are identified and described in Chapters 9 and 12. The follow-up monitoring program implemented by Equinor Canada will focus upon sensitive marine environments. As the program is not yet designed, issues such as drill cuttings dispersion, sedimentation, produced water dispersion and sound emissions may be included. Details on follow-up monitoring are contained in Chapter 18.***	***Section 6.1.1.5*** ***Section 9.2.3.2*** ***Section 9.2.6.3*** ***Section 12.2.1.1*** ***Section 12.2.3.1*** ***Section 18.4***
Project Concept and Design – activities including vessel traffic	***Details respecting Project concept and design and activities, including vessel traffic, have been provided to Indigenous groups during Equinor Canada's ongoing engagement activities. In addition, Project details were summarized in a power point presentation which was provided to each Indigenous Group and discussed at in-person meetings (see Appendix [##]). Three Workshops were held in October 2018 at which a Project update was presented. Chapter 2 of the EIS presents a detailed description of preliminary Project design and components.***	***Section 2.5*** ***Appendix ##***
Accidents and Malfunctions – potential effects and emergency response	***The potential effects of accidents and malfunctions and Equinor Canada's emergency response plans are set out in Chapter 16. Equinor Canada is committed to becoming an industry leader on safety and will comply with all regulatory standards respecting worker and***	***Section 1.3.2*** ***Section 16.1*** ***Appendix N***

	environmental safety, as outlined in Chapter 1 of the EIS.A key focus is on prevention. Spill prevention will be incorporated into Project design and operations and facilities, processes and management system procedures are intended to reduce or eliminate the chance of a spill. Proper environmental operating practices will be assured through regular inspections and audits of the drilling installation and FPSO and through ongoing training of offshore workers, including specific training in oil spill prevention, reporting and response requirements, and procedures. Oil spill prevention, response, and overall preparedness approaches for the Project will be further developed and defined as the various regulatory review and approval processes move forward. Equinor Canada will develop and implement a Project Oil Spill Response Plan which will be submitted to the C-NLOPB as part of the Operations Authorization (OA) application process described in Chapter 1. Details of this plan and other emergency response measures are set out in Chapter 16 and additional information on Well Intervention Response Strategies and related matters is set out in Appendices XXX. Equinor is prepared to effectively respond to an oil spill offshore and is equipped with the necessary response tools, personnel and strategies.	
Carbon Emissions	***Equinor strives to be an industry leader on safety and is actively shaping its portfolio to deliver high value with a low carbon footprint. Equinor's approach to sustainability is based in part upon low carbon and reducing the CO_2 footprint of its operations. An air emissions and dispersion modelling study to estimate the Project-related quantities of air contaminants and greenhouse gases and to predict associated ground-level concentrations of air contaminants in the vicinity of the Project was undertaken. A summary of study results as well as other information respecting air contaminants and greenhouse gases is presented in Chapter 8 and in the Technical Data Report for Air Quality and Greenhouse Gases in Appendix K.***	***Chapter 8*** ***Appendix K***
Flaring	***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. Routine flaring will not occur. Non-routine and/or safety flaring, when required, will be very short in duration (a few hours) and will occur during initial start-up of the facility and***	***Section 2.8.1*** ***Section 8.5***

	during shut-down and start-up activities related to planned maintenance turnarounds. Estimated emissions from non-routine/safety flaring are provided EIS S. 2.8.1 and S. 8.5.	
Abandoned Wells – liability for abandoned wells	***Regulations passed pursuant to the Atlantic Accord Acts and Guidelines Respecting Financial Requirements (C-NLOPB 2017) require an Operator to demonstrate that it is capable of acting in a responsible manner for the life of the proposed activity. Pursuant to the NL Offshore Petroleum Drilling and Production Regulations, a Decommissioning and Abandonment Plan based on an approved Development Plan must be submitted to C-NLOPB. The plan must consider any new regulatory requirements, best practices, or international laws or agreements to which Canada is bound that have come into force since the Development Plan was approved and a new environmental assessment may be required. Under section 9 of the C-NLOPB Guidelines Respecting Financial Responsibility, the operator must file proof of financial resources to cover the costs of abandonment, including any potential liability. Wells, once abandoned, continue to be subject to the provisions of the Atlantic Accord Acts respecting liability for losses or damages resulting from the discharge, emission or escape of oil and gas.***	***Not within the scope of the Guidelines***
Incorporation of Indigenous Knowledge	***Equinor Canada has made every reasonable effort to collect and incorporate traditional Indigenous knowledge into the EIS. Equinor Canada has invited Indigenous groups to provide traditional knowledge during the course of engagement and has in addition, offered to enter into agreements with various groups for the collection of Indigenous knowledge. Equinor Canada also commissioned an Indigenous Knowledge Desktop Study. Information contained in this study, together with information provided during engagement and information from other sources, has been taken into account in the development of the ecosystem approach throughout the EIS and was used to identify species of interest to Indigenous groups.***	***Appendix H***

Table 3.15 Meetings and Discussions with Woodstock First Nation

Date	Activity	Purpose and Focus
June 14, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor.

June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter, summary and map.
July 10, 2018	Outgoing Phone Call	Follow-up to letter. No answer, left message.
July 10, 2018	Outgoing Email	Follow-up to phone call, requesting phone call to discuss next steps in engagement.
July 18, 2018	Outgoing Phone Call	Follow-up phone call. No answer, left message.
July 18, 2018	Incoming Email	Advising of availability for a call July 19 or 20, or early the following week.
July 18, 2018	Outgoing Email	Proposing a phone call early in the week of July 23.
August 6, 2018	Incoming and Outgoing Emails	Email chain regarding scheduling an in-person meeting in Woodstock August 29.
August 8, 2018	Outgoing Email	Confirmation of August 29 meeting.
August 16, 2018	Outgoing Email	Transmission of PowerPoint presentation.
August 16, 2018	Incoming Email	Regarding meeting venue.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
August 29, 2018	In-Person Meeting	Presentation of Bay du Nord Project overview. Discussion of issues of concern, particularly the potential impact on salmon and American eel. Limited discussion of cumulative effects and activities in NS offshore. Agreement to provide periodic Project updates.
August 29, 2018	Outgoing Email	Confirming agreed-upon engagement process.
October 19, 2018	Workshop	Half day workshop in Moncton to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	E-mail inviting additional comments on potential environmental effects/proposed mitigation measures.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	**Response**	**EIS Reference**

Project Operations and Activities – number of wells, drilling depths, project footprint	***Details respecting Project operations and activities have been provided to Indigenous groups during Equinor Canada's ongoing engagement activities. In addition, Project details were summarized in a power point presentation which was provided to each Indigenous Group and discussed at in-person meetings (see Appendix [##]). Three Workshops were held in October 2018 at which a Project update was presented. A detailed description of Project operations and activities is contained in Chapter 2 of the EIS.***	***Section 2.5*** ***Appendix ##***
Indigenous Engagement – capacity funding to participate in EA process	***Questions related to the provision of capacity funding to enable Indigenous groups to participate in the environmental assessment process are referred to the CEA Agency.***	***Not within the scope of the Guidelines***
Marine Protected Areas – impact of Project	***Marine Protected Areas and other Special Areas in the RSA are described in Chapter 6. The potential effects of the Project upon Special Areas are identified and assessed in Chapter 12.***	***Section 6.4*** ***Section 12.2***
Spills and impacts on traditional waters	***Accidents and malfunctions are discussed in Chapter 16. Spill modelling of a representative range of worst-case scenarios was conducted for the Project, including unmitigated subsurface blowouts at two locations in the Project Area (the worst-case scenario with between a one in 207,000,000 to one in 414,000,000 chance of occurrence). It is Equinor Canada's conclusion that even in such a worst-case scenario (without the application of mitigation and response measures) given prevailing currents there is only a very low probability that a very small amount of oil (less than 1% of released oil) would make shoreline contact to the west of the Project Area. Most of that contact is predicted to occur on the Avalon Peninsula and localized areas of the Burin Peninsula. No contact with the traditional waters of any Indigenous group is predicted.***	***Section 16.1***
Impact on Corals and Sponges	***The function and ecological role of corals and sponges, including habitat, is discussed in chapter 6. Chapter 9 provides an effects assessment of project activities on Marine Fish and Fish Habitat, including corals and sponges. The relationship between corals and sponges and EBSAs, SBAs and VMEs is described in Section 12.2 of the EIS. Chapter 16 assesses the effects of accidents and malfunctions, including the effects of an unmitigated subsurface blowout on Marine Fish and Fish Habitat, including corals and sponges. Recognizing the important role played by corals and sponges in the marine ecosystem,***	***Section 6.1.1.5*** ***Section 9.1.4*** ***Section 9.2.3.2*** ***Section 12.2*** ***Section 16.7***

	Equinor Canada has completed a seabed survey (detailed in Section 6.1.1.5) to provide a better dataset for assessing coral and sponge densities in the Project Area. 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.	

Table 3.16 Meetings and Discussions with Peskotomuhkati Nation at Skutik (Passamaquoddy)

Date	Activity	Purpose and Focus
June 14, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter, summary and map.
July 18, 2018	Outgoing Phone Call	Follow-up to Project Description correspondence.
July 18, 2018	Incoming Phone Call	Discussion of Chief's schedule and potential timing of an in-person meeting.
July 18, 2018	Outgoing Email	Indicating interest in discussing next steps in engagement.
August 6, 2018	Outgoing Email	Proposal for an in-person meeting on August 28 or 29.
August 9, 2018	Outgoing Phone Call	Follow-up phone call regarding proposed in-person meeting on August 28 or 29.
August 13, 2018	Incoming Phone Call	Confirmation of interest in meeting in St. Stephen on August 28, 2018.
August 16, 2018	Outgoing Email	Transmission of PowerPoint presentation and confirmation of time and location of meeting.
August 16, 2018	Incoming Email	Confirmation of date and time of meeting.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
August 28, 2018	In-Person Meeting	Presentation of Bay du Nord Project overview. Discussion of issues of concern, particularly the potential impact on herring and gaspereau. Equinor Canada agrees to provide periodic Project updates.
August 28, 2018	Outgoing Email	Confirming next steps in engagement.

September 13, 2018	Outgoing Email	Email providing link to spill reporting by C-NLOPB as committed at August 28 meeting.
October 19, 2018	Workshop	Half day workshop in Moncton to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials and inviting additional comments.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	E-mail transmitting invoicing material and inviting additional comments on potential environmental effects/proposed mitigation measures
November 9, 2018	Incoming Email	Confirming accuracy of baseline information.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	**Response**	**EIS Reference**
Direct and indirect impacts of spills on Marine Species of traditional/commercial importance – herring, gaspereau, mackerel	***Through its ongoing engagement activities as well as information contained in the Indigenous Knowledge desktop study, Equinor Canada is aware of the social, cultural, traditional and economic importance of marine fish and fish habitat to Indigenous groups. Information on species of either traditional or commercial importance such as herring, gaspereau and mackerel has been incorporated into baseline information (see chapters 6 and 7). Potential effects (direct and indirect) on of the Project upon fish and fish habitat, commercial fisheries and subsistence fisheries and associated mitigation measures are discussed in Chapters 9, 13 and 14 respectively. Potential cumulative effects upon fish and fish habitat are identified and assessed in Chapter 15 and the potential impact of spills upon both commercial and subsistence fisheries is discussed in Chapter 16.***	***Section 6.1.8.3*** ***Section 7.3.4*** ***Section 7.3.5*** ***Section 7.3.6*** ***Section 7.3.8.2*** ***Section 9.1.5*** ***Section 13.1.5*** ***Section 14.1.5.3*** ***Section 15.2*** ***Section 16.7***
Marine Mammals – right whales, harbour porpoises – ship strikes	***The potential impacts of the project upon marine mammals, including right whales, are identified and assessed in Chapter 11. It is Equinor Canada's assessment that the likelihood of ship strikes of right whales is low due to the projected low volume and frequency of Project-related vessel traffic. Furthermore, the vessel traffic corridor is not within specific areas that have***	***Section 11.2.4*** ***Section 11.4***

	been identified as marine mammal breeding grounds, feeding concentrations, and/or migration routes. 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 vessel will alter course and/or reduce speed if a marine mammal(s) (or sea turtle) is detected ahead of the vessel. While it is highly unlikely that surface active groups of North Atlantic right whales will occur along the vessel traffic route to the Project Area, if one is detected by Project vessel crew, the sighting(s) will be reported immediately to DFO.	
Standards for oil transport/loading	***Oil transport and loading is described in Chapter 2. The Project is located approximately 500 km offshore from St. John's. 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 shuttle tankers are subject to international maritime requirements (i.e., International Maritime Organization or IMO) and must adhere to the regulatory framework of the IMO as well as those of the vessel's flag state.***	***Section 2.1*** ***Section 2.6.4.4***

Table 3.17 Meetings and Discussions with Mi'kmaq Confederacy of Prince Edward Island (MCPEI)

Mi'kmaq Confederacy of Prince Edward Island (MCPEI): *Aggregate body for the Abegweit First Nation and Lennox Island First Nation with regard to engagement Key Issues and Questions Raised are those identified through engagement with MCPEI and not by constituent member communities.* ***Correspondence with MCPEI unless otherwise indicated.***

Date	Activity	Purpose and Focus
June 13, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor.
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter, including summary and map.
June 25, 2018	Outgoing Letter to Abeqweit First Nation	Project Description notification letter, including Project summary and map.
June 25, 2018	Outgoing Letter to Lennox Island First Nation	Project Description notification letter, including Project summary and map.
July 10, 2018	Outgoing Phone	Phone call to discuss the next steps in engagement. No answer, left message.

July 10, 2018	Outgoing Email	Follow-up email requesting an opportunity to discuss the next steps in engagement.
July 18, 2018	Outgoing Phone Call	Phone call. No answer, left message.
July 23, 2018	Outgoing Email	Follow-up email requesting an opportunity to discuss the next steps in engagement.
July 30, 2018	Incoming Email	Email from MCPEI requesting a conference call.
July 30, 2018	Outgoing Email	Email confirming availability for a conference call August 2, 2017.
July 30, 2018	Incoming and Outgoing Emails	Email chain regarding rescheduling conference call to August 13, 2018.
August 9, 2018	Outgoing Email	Transmission of PowerPoint presentation and draft agenda for August 13 conference call.
August 9, 2018	Incoming Email	Confirming receipt of materials and agreeing to revisions to agenda.
August 13, 2018	Conference Call	Conference call to provide BdN Project overview and discuss issues of concern to MCPEI and the engagement process. Parties agreed that Equinor Canada will continue to provide relevant Project-related information. Conference calls will be held at Project milestones, although frequency and scope of engagement would be revisited if circumstances require. No major issues noted; concern expressed for possible impacts on migratory species (salmon) due to spills, lack of capacity funding and questions about modelling that would be done for EIS.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
September 5, 2018	Outgoing Email	Follow-up to conference call outlining next steps in engagement.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials, inviting additional comments, and offering conference call to discuss. Equinor Canada also committed to providing workshop report when all comments have been received.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	Email transmitting invoicing information (regarding workshop) and inviting additional comments on potential effects and proposed mitigation measures.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	Response	EIS Reference
Applicable Regulatory Regime – role of C-NLOPB	***Information on the applicable regulatory regime, including the role of the C-NLOPB, is contained in Chapter 1.***	***Section 1.3***
Project Description – location, components and activities	***Details respecting Project location, components and activities have been provided to Indigenous groups during Equinor Canada's ongoing engagement activities. In addition, Project details were summarized in a power point presentation which was provided to each Indigenous Group and discussed at in-person meetings (see Appendix [##]). Three Workshops were held in October 2018 at which a Project update was presented. A detailed description of Project location, components and activities is contained in Chapter 2 of the EIS.***	***Section 2.4*** ***Section 2.5*** ***Appendix ##***
Spills and Safety Record	***The potential effects of accidents and malfunctions and Equinor Canada's emergency response plans are set out in Chapter 16. Equinor Canada is committed to becoming an industry leader on safety and will comply with all regulatory standards respecting worker and environmental safety, as outlined in Chapter 1 of the EIS. A key focus is on prevention. Spill prevention will be incorporated into Project design and operations and facilities, processes and management system procedures in order to reduce or eliminate the chance of a spill. Proper environmental operating practices will be assured through regular inspections and audits of the drilling installation and FPSO and through ongoing training of offshore workers, including specific training in oil spill prevention, reporting and response requirements, and procedures. Oil spill prevention, response, and overall preparedness approaches for the Project will be further developed and defined as the various regulatory review and approval processes move forward. Equinor Canada will develop and implement a Project Oil Spill Response Plan which will be submitted to the C-NLOPB as part of the Operations Authorization (OA) application process described in Chapter 1. Details of this plan and other emergency response measures are set out in Chapter 16 and additional information on Well Intervention Response Strategies and related matters is set out in Appendices XXX. Equinor Canada is prepared to effectively respond to an oil spill offshore and is equipped with the necessary response tools, personnel and strategies.***	***Section 1.3.2*** ***Section 16.1*** ***Appendix N***

Spill trajectory/modelling	***Accidents and malfunctions are discussed in Chapter 16. Spill modelling of a representative range of unmitigated worst-case scenarios was conducted for the Project, (the worst-case subsurface blowout scenario with between a one in 207,000,000 to one in 414,000,000 chance of occurrence). It is Equinor Canada's conclusion that even in such a worst-case scenario (without the application of mitigation and response measures) given prevailing currents there is only a very low probability that a very small amount of oil (less than 1% of released oil) would make shoreline contact to the west of the Project Area. Most of that contact is predicted to occur on the Avalon Peninsula and localized areas of the Burin Peninsula. No contact with the traditional waters of any Indigenous group is predicted.***	***Section 16.1*** ***Section 16.2***
Offloading and Transport of Oil	***Oil transport and loading is described in Chapter 2. The Project is located approximately 500 km offshore from St. John's. 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 shuttle tankers are subject to international maritime requirements (i.e., International Maritime Organization or IMO) and must adhere to the regulatory framework of the IMO as well as those of its flag state.***	***Section 2.1***
Air Emissions - modelling	***To support the regulatory review of the Project, an air emissions and dispersion modelling study was conducted. The purpose of the study was to estimate the Project-related quantities of air contaminants and greenhouse gases (GHGs) released to the atmosphere and to predict associated ground-level concentrations of air contaminants in the vicinity of the Project. A summary of study results as well as other information respecting air contaminants and greenhouse gases is presented in Chapter 8 and in the Technical Data Report for Air Quality and Greenhouse Gases in Appendix K.***	***Section 8.6*** ***Appendix K***
Impacts on salmon – species of traditional importance	***Equinor Canada is aware of the social, cultural, traditional and economic importance of fish and fish habitat to Indigenous groups. In particular, Indigenous groups have emphasized the traditional cultural importance of salmon during Equinor Canada's ongoing engagement activities. Salmon is also a species of concern identified in the Indigenous Knowledge Desktop Study. Information on the various uses of salmon and***	***Section 6.1.9.6*** ***Section 7.3.8.2*** ***Section 9.4*** ***Section 14.1.5*** ***Section 16.7.4*** ***Appendix H***

	other species of concern by Indigenous peoples has been incorporated into Chapter 7. Potential direct effects of the Project upon fish and fish habitat, including salmon, resulting from routine Project activities are identified and assessed in Chapter 9 and potential effects resulting from accidents and malfunctions are identified and assessed in Chapter 16. Associated indirect effects upon Indigenous people (subsistence fishing, health, socio-economic and cultural effects) related to potential direct effects upon salmon are identified and assessed in Chapters 14 and 16. These chapters conclude that no significant direct effects upon marine fish or fish habitat or indirect effects (health, cultural or socio-economic) upon Indigenous peoples are predicted to result from routine Project activities.	
Application of Mitigation Measures	***Each VC chapter contains VC-specific mitigation measures which are summarized in Chapter 18. 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 reduce adverse impacts upon 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. In addition, potential mitigation measures have been discussed with various Indigenous groups during three Workshops which were held in 2018.*** ***Equinor Canada and its contractors will comply with all applicable mitigation measures which will be implemented and tracked in accordance with Equinor Canada's existing policies and procedures. Mitigation measures will be integrated into the Project's Environmental Protection Plan (EPP) which will be submitted to the C-NLOPB as part of the Operations Authorization process. An Environmental Effects Monitoring (EEM) program will be developed, intended, in part, to monitor the effectiveness of mitigation measures.***	***Section 18.2***
Indigenous Engagement – Capacity Funding	***Equinor Canada is committed to continuing to provide opportunities to Indigenous groups for information-sharing and exchange as requested or required in the post-EIS period in order to discuss issues and concerns. The specifics of engagement processes will be developed through discussions with the various groups. Questions***	***Not within the scope of the EIS Guidelines***

	related to the provision of capacity funding to enable Indigenous groups to participate in the environmental assessment process are referred to the CEA Agency.	

Table 3.18 Meetings and Discussions with Mi'gmawei Mawiomi Secretariat (MMS)

Mi'gmawei Mawiomi Secretariat (MMS): *Aggregate body for Micmas of Gesgapegiag, La Nation Micmac de Gespeg and Listuguj Mi'gmaq Government regarding engagement.*		
Date	**Activity**	**Purpose and Focus**
June 13, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor.
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter, including summary and map.
July 25, 2018	Outgoing Email	Requesting a conference call to discuss next steps.
August 10, 2018	Outgoing Email	Reiterating wish to engage and proposing a conference call in September.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
September 20, 2018	Outgoing Email	Email reiterating wish to engage and proposing a conference call. PowerPoint presentation attached for information.
October 16, 2018	Workshop	Half day workshop in Quebec City to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 22, 2018	Outgoing Email	Follow-up to workshop transmitting workshop materials, inviting additional comments, and offering conference call to discuss. Equinor Canada also committed to providing workshop report when all comments have been received.
October 23, 2018	Outgoing Email	Email requesting call to suggest possible sharing of Indigenous Knowledge.
November 8, 2018	Outgoing Email	Email transmitting invoicing information and inviting additional comments on potential effects and proposed mitigation measures.
December 14, 2018	Outgoing Email	Transmission of the Workshop Report which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***
Key Issues and Questions Raised	**Response**	**EIS Reference**

Impacts on Salmon and other species of cultural significance	***Equinor Canada is aware of the social, cultural, traditional and economic importance of fish and fish habitat to Indigenous groups. In particular, Indigenous groups have emphasized the traditional cultural importance of salmon during Equinor Canada's ongoing engagement activities. Salmon is also a species of concern identified in the Indigenous Knowledge Desktop Study. Information on the various uses of salmon and other species of concern by Indigenous peoples has been incorporated into Chapter 7. Potential direct effects of the Project upon fish and fish habitat, including salmon, resulting from routine Project activities are identified and assessed in Chapter 9 and potential effects resulting from accidents and malfunctions are identified and assessed in Chapter 16. Associated indirect effects upon Indigenous people (subsistence fishing, health, socio-economic and cultural effects) related to potential direct effects upon salmon are identified and assessed in Chapters*** 14 and 16. ***These chapters conclude that no significant direct effects upon marine fish or fish habitat or indirect effects (health, cultural or socio-economic) upon Indigenous peoples are predicted to result from routine Project activities.***	***Section 6.1.9.6*** ***Section 7.3.8.2*** ***Section 9.4*** ***Section 14.1.5*** ***Section 16.7.4*** ***Appendix H***

Table 3.19 Meetings and Discussions with Les Innus de Ekuanitshit (Innu First Nation of Ekuanitshit)

Date	Activity	Purpose and Focus
June 13, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 14, 2018	Outgoing Letter	Project Description notification letter, including summary and map.
July 17, 2018	Incoming Letter	Letter seeking clarification of EIS scope regarding salmon prior to discussing next steps in engagement.
July 30, 2018	Outgoing Email	E-mail response clarifying salmon populations that will be considered in EIS.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
September 22, 2018	Outgoing Email	Proposal to hold conference call to provide Project overview.

October 5, 2018	Outgoing Email	Transmission of translated PowerPoint presentation and offer to meet by phone to discuss.
October 24, 2018	Outgoing Email	Email transmitting workshop materials, inviting further comments, and offering a conference call to discuss. Commitment to provide workshop report when completed and translated.
November 2, 2018	Incoming Letter	Indicating that would advise Equinor Canada of interest in conference call when Participant Funding decision made by the CEA Agency and reiterating importance of salmon. No further expression of interest
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
December 22, 2018	Outgoing Email	Transmission of the Workshop Report, which is included in Appendix G.
April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***

Key Issues and Questions Raised	**Response**	**EIS Reference**
Impacts on Salmon and other species of cultural importance	***Equinor Canada is aware of the social, cultural, traditional and economic importance of fish and fish habitat to Indigenous groups. In particular, Indigenous groups have emphasized the traditional cultural importance of salmon during Equinor Canada's ongoing engagement activities. Salmon is also a species of concern identified in the Indigenous Knowledge Desktop Study. Information on the various uses of salmon and other species of concern by Indigenous peoples has been incorporated into Chapter 7. Potential direct effects of the Project upon fish and fish habitat, including salmon, resulting from routine Project activities are identified and assessed in Chapter 9 and potential effects resulting from accidents and malfunctions are identified and assessed in Chapter 16. Associated indirect effects upon Indigenous people (subsistence fishing, health, socio-economic and cultural effects) related to potential direct effects upon salmon are identified and assessed in Chapters 14 and 16. These chapters conclude that no significant direct effects upon marine fish or fish habitat or indirect effects (health, cultural or socio-economic) upon Indigenous peoples are predicted to result from routine Project activities.***	***Section 6.1.9.6*** ***Section 7.3.8.2*** ***Section 9.4*** ***Section 14.1.5*** ***Section 16.7.4*** ***Appendix H***

Table 3.20 Meetings and Discussions with Première Nation des Innus de Nutashkuan

Date	Activity	Purpose and Focus
June 14, 2018	Outgoing Email	Introduction of Equinor Canada's Sustainability Advisor.
June 14, 2018	Incoming Email	Email acknowledging introduction.
June 21, 2018	Outgoing Email	Notification of filing of Bay du Nord Project Description with the CEA Agency.
June 25, 2018	Outgoing Letter	Project Description notification letter, including summary and map.
August 27, 2018	Outgoing Email	Invitation to attend half day workshop to discuss Bay du Nord Project, potential effects and proposed mitigation.
September 22, 2018	Outgoing Email	Invitation to schedule a conference call in early October to provide Project overview. Commitment to provide translated PowerPoint presentation.
September 24, 2018	Incoming Email	Declining invitation for conference call as update would be provided at workshop in Quebec City.
October 5, 2018	Outgoing Email	Transmission of PowerPoint presentation and offer of phone call to discuss.
October 16, 2018	Workshop	Half day workshop in Quebec City to discuss potential environmental effects and proposed mitigation measures associated with the Project. Refer to Appendix G for workshop materials.
October 24, 2018	Outgoing Email	Email transmitting workshop materials and inviting further comment. Commitment to provide workshop report when completed and translated.
October 24, 2018	Incoming Email	Nutashkuan acknowledge receipt of workshop materials.
November 6, 2018	Outgoing Email	Transmission of community baseline (Chapter 7) for review and comment.
November 8, 2018	Outgoing Email	Email transmitting invoicing material and inviting any additional comments on potential environmental effects and proposed mitigation measures.
November 13, 2018	Incoming Email	Nutashkuan commit to prompt reply regarding EIS community profile information.
November 14, 2018	Incoming Email	Email containing Nutashkuan's proposed revisions to community profile.
December 22, 2018	Outgoing Email	Transmission of the Workshop Report which is included in Appendix G.
December 28, 2018	Incoming Email	Acknowledgement of receipt of Workshop Report.

April 10, 2019	***Outgoing Email***	***Advising of MOU between CEAA and C-NLOPB and status of Bay du Nord Development Project EA***
April 11, 2019	***Incoming Email***	***Acknowledgement of receipt of EA update email***
Issues and Questions Raised	**Response**	**EIS Reference**
Impacts on Salmon and other Species of Concern	***Equinor Canada is aware of the social, cultural, traditional and economic importance of fish and fish habitat to Indigenous groups. In particular, Indigenous groups have emphasized the traditional cultural importance of salmon during Equinor Canada's ongoing engagement activities. Salmon is also a species of concern identified in the Indigenous Knowledge Desktop Study. Information on the various uses of salmon and other species of concern by Indigenous peoples has been incorporated into Chapter 7. Potential direct effects of the Project upon fish and fish habitat, including salmon, resulting from routine Project activities are identified and assessed in Chapter 9 and potential effects resulting from accidents and malfunctions are identified and assessed in Chapter 16. Associated indirect effects upon Indigenous people (subsistence fishing, health, socio-economic and cultural effects) related to potential direct effects upon salmon are identified and assessed in Chapters 14 and 16. These chapters conclude that no significant direct effects upon marine fish or fish habitat or indirect effects (health, cultural or socio-economic) upon Indigenous peoples are predicted to result from routine Project activities.***	***Section 6.1.9.6*** ***Section 7.3.8.2*** ***Section 9.4*** ***Section 14.1.5*** ***Section 16.7.4*** ***Appendix H***

Table 3.21 October 2018 Workshop Issues and Concerns

Issues and Concerns	Response	EIS Reference
Atmospheric Conditions: • **Air and sound emissions** • **Use of technology, monitoring** **Climate change and greenhouse gases**	• **The impacts of sound emissions on marine fish and fish habitat, marine and migratory birds and marine mammals and sea turtles are identified and assessed in Chapters 9, 10 and 11, respectively. Equinor Canada has conducted sound propagation modelling and has concluded that with the application of appropriate mitigation measures, there are no significant effects upon any of these VCs.** • **An environmental effects monitoring program will be implemented to verify the**	**Section 8.3.2** **Section 8.5.1.2** **Section 9.1.4** **Section 9.2** **Section 10.2** **Section 10.5** **Section 11.1.4** **Section 11.4** **Appendix K**

	EIS effects predictions. Indigenous groups will be engaged in the development of the EEP as appropriate. • **With respect to air emissions, and greenhouse gases, an air emissions and dispersion modelling study was conducted to estimate the Project-related quantities of air contaminants and greenhouse gases (GHGs) released to the atmosphere and to predict associated ground-level concentrations of air contaminants in the vicinity of the Project. A summary of study results as well as other information respecting air contaminants and greenhouse gases is presented in Chapter 8 and in the Technical Data Report for Air Quality and Greenhouse Gases in Appendix K.** • **There will be no routine flaring.** • **Equinor Canada will employ best treatment practices that are commercially available and economically feasible to address discharges and emissions**	
Indigenous People Interactions • **Focus on shoreline interactions** • **Species of concern (salmon, American eel, right whales)** • **Effects of spills on coastal communities**	• **The EIS considers interactions in the Core BdN Area, the Project Area, the Local Study Area and the Regional Study Area (RSA). As defined in Chapter 14, the RSA for Indigenous Peoples an overall region of eastern Canada that generally encompasses each of the Indigenous communities and their activities throughout NL, the Maritime provinces and Québec, including those parts of traditional lands and waters included in the RSA. As a result, Chapters 14 and 16 take into account potential shoreline interactions with the traditional lands and waters of the various Indigenous groups.** • **Through its ongoing engagement activities, Equinor Canada is aware of the social, cultural and traditional importance of fish and marine mammal species, particularly salmon, American eel and right whales, to Indigenous groups in the Atlantic regions. Information on species of traditional importance has been incorporated into baseline information (Chapters 6 and 7). The effects of the Project upon marine fish and fish habitat, marine and migratory birds and marine mammals and associated effects on Indigenous peoples are identified and discussed in Chapters 9, 10, 11 and 14.**	**Section 6.1.9.2** **Section 6.1.9.6** **Section 6.3.7.2** **Section 7.3.8.2** **Section 9.4** **Section 10.2.1.3** **Section10.5.2** **Section 11.1.5** **Section 14.1.1** **Section 14.4** **Section 16.4.3.1** **Appendix H**

	These chapters conclude that no significant direct effects upon marine fish or fish habitat, marine and migratory birds or marine mammals or indirect effects (health, cultural or socio-economic) upon Indigenous peoples are predicted to result from routine Project activities. • **The effects of spills (including unmitigated subsurface blowouts) have been the subject of modelling. A subsurface blowout is extremely unlikely and, in any event, less than .1% of released oil is predicted to make shoreline contact, with most of that contact occurring on the Avalon Peninsula and localized areas of the Burin Peninsula. No contact with the traditional lands or waters of any Indigenous group is predicted.**	
Marine and Migratory Birds: • ***bird deterrent technology*** • ***impact of lighting, flaring, seismic testing*** • ***bird searches***	***The potential effects of the Project upon marine and migratory birds have been identified and assessed in Chapter 10. Bird deterrent technology is not recommended by ECCC. However, a number of mitigation measures are proposed, including the following:*** • ***reduction of lighting on the FPSO subject to worker and operational safety*** • ***engagement with ECCC and evaluation of lighting reduction options*** • ***no routine flaring and recovery of low pressure flare gas*** • ***use of common traffic routes for vessels and helicopters*** • ***helicopter and vessel transit routes will adhere to periods of avoidance and specific set-back distances to reduce disturbances to established migratory bird colonies*** • ***avoidance of low-level flight aircraft operations*** • ***The potential effects of lighting, flaring and underwater sound associated with seismic surveys upon marine and migratory birds, are assessed in Chapter 10.*** • ***Equinor Canada will develop a protocol for systematic searches for, and documentation of stranded seabirds in consultation with Environment and Climate Change Canada (ECCC) Canadian Wildlife***	***Section 10.1.5***

	Service (CWS). All occurrences will be documented and reported to ECCC.	
Discharges, including Produced Water • ***commitment to use best available technology and monitoring*** • ***Sedimentation***	• ***Equinor Canada will treat produced water as well as other discharges using best treatment practices that are commercially available and economically feasible. A description of the proposed treatment package for produced water is provided in Section 2.7.1.5 of the EIS. All discharges will be in accordance with applicable regulatory requirements. Equinor Canada's EPP will include plans for the management of waste materials generated during the Project (both hazardous and non-hazardous materials), such as oily wastes, waste chemicals and containers, domestic wastes etc. All wastes will be managed in accordance with the OWTG.*** • ***As the follow-up monitoring program is not yet designed, issues such as drill cuttings dispersion, sedimentation, produced water dispersion and sound emissions may be included. Indigenous groups will be engaged as appropriate in the development of follow-up monitoring programs. Details on follow-up monitoring are contained in Chapter 18.***	***Section 2.7.1.5*** ***Section 18.2*** ***Section 18.4***
Marine Mammal and Sea Turtles • ***mitigation measures*** • ***effects of sound*** • ***injury and mortality (vessel strikes) and use of marine mammal observers*** • ***Need to take into account the significance of marine mammals (e.g. seals and walrus) as an important food source for Inuit and need to recognize the cultural importance of marine mammals*** • ***Need for continuous monitoring of discharges***	• ***Potential mitigation measures are set out in Workshop materials and in Chapter 11 of the EIS. An inventory of potential mitigation measures were provided to each Indigenous group for review and comment (see Appendix XXX).*** • ***The primary sensory cues for marine mammals are auditory. A 50 km zone of influence, which borders the entire Project Area, was used in the EIS to assess effects of sound upon marine mammals. It is Equinor Canada's conclusion that the potential for injuries resulting from sound is limited due to the localized nature of the sound and the transient nature of marine mammals.*** • ***Injuries to/mortality of marine mammals resulting from vessel strikes are considered unlikely. There are no specific areas along the vessel traffic route that have been identified as marine mammal breeding grounds, feeding concentrations, and/or migration route. Consistent with***	***Section 7.3*** ***Section 11.1.5*** ***Section 14.1.5*** ***Appendix G***

	International Regulations for Preventing Collisions at Sea, 1972 with Canadian Modifications, Rule 5, every vessel shall maintain a proper lookout at all times. Project vessel will alter course and/or reduce speed if a marine mammal(s) (or sea turtle) is detected ahead of the vessel. • ***Equinor Canada is aware of the cultural importance of specific marine mammals to Indigenous groups as a result of its ongoing engagement activities, including the October workshops and through information contained in the Indigenous Knowledge Desktop Study. Species of interest to Indigenous groups are described in Chapter 7 and effects upon those species and upon associated Indigenous interests are identified and assessed in Chapters 11 and 14 respectively.*** • ***The vast majority of oceangoing 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 necessary.*** • ***All discharges will be in accordance with applicable regulatory requirements. Equinor Canada's EPP will include plans for the management of waste materials generated during the Project (both hazardous and non-hazardous materials), such as oily wastes, waste chemicals and containers, domestic wastes etc. All wastes will be managed in accordance with the OWTG.***	
Indigenous Peoples – species of cultural importance, communal-commercial fisheries	• ***Through its ongoing engagement activities and based on information contained in the Indigenous Knowledge Desktop Study, Equinor Canada is aware of the social, cultural, traditional and economic importance of fish and fish habitat to Indigenous groups, in articular salmon and American eel.*** • ***Information on species of traditional or cultural importance has been***	***Section 6.1.9.2*** ***Section 6.1.9.6*** ***Section 7.1*** ***Section 7.3.8.2*** ***Section 9.4*** ***Section 13.1*** ***Section 14.1.5*** ***Section 16.7.4*** ***Appendix H***

	incorporated into baseline information (Chapters 6 and 7). The effects of the Project upon species of cultural importance and associated effects upon Indigenous peoples are identified and assessed in Chapters 9, 10, 11 and 14. These chapters conclude that no significant direct effects upon species of traditional or cultural importance (including species associated with FSC harvesting) or indirect effects (health, cultural or socio-economic) upon Indigenous peoples are predicted to result from routine Project activities. • ***Equinor Canada is aware that many Indigenous groups hold commercial communal licences for a variety of species in NAFO Divisions 3L and 3M, including commercial-communal licences for Atlantic bluefin tuna and swordfish. Equinor Canada is also aware that revenue from commercial-communal fisheries is an important source of funding for Indigenous community services and programs. Baseline information respecting commercial fish species and communal commercial fisheries is set out in Chapter 7 and the potential effects of the Project upon communal commercial fisheries is discussed in Chapter 13. Available data does not indicate any domestic commercial or commercial-communal fishing activity in the Core BdN Area. Levels of harvesting are generally low in the Project Area and concentrated in the western and northern portions. There are no recorded landings of either tuna or swordfish in the Project Area between 2011 and 2016.***	
Accidents and Malfunctions – spill communications, spill response measures	***The potential effects of accidents and malfunctions and Equinor Canada's emergency response plans are set out in Chapter 16. Equinor Canada is committed to becoming an industry leader on safety and will comply with all regulatory standards respecting worker and environmental safety, as outlined in Chapter 1 of the EIS. A key focus is on prevention. Spill prevention will be incorporated into Project design and operations and facilities, processes and management system procedures are intended to reduce or eliminate the chance of a spill. Proper environmental operating practices will be assured through regular***	***Section 1.3.2*** ***Section 16.1*** ***Appendix N***

	inspections and audits of the drilling installation and FPSO and through ongoing training of offshore workers, including specific training in oil spill prevention, reporting and response requirements, and procedures. Oil spill prevention, response, and overall preparedness approaches for the Project will be further developed and defined as the various regulatory review and approval processes move forward. Equinor Canada will develop and implement a Project Oil Spill Response Plan which will be submitted to the C-NLOPB as part of the Operations Authorization (OA) application process described in Chapter 1. Details of this plan and other emergency response measures are set out in Chapter 16 and additional information on Well Intervention Response Strategies and related matters is set out in Appendices XXX. Equinor is prepared to effectively respond to an oil spill offshore and is equipped with the necessary response tools, personnel and strategies.	
Cumulative Effects • ***General approach*** • ***Impacts on Marine Fish and Fish Habitat***	***Equinor Canada has identified and assessed cumulative effects using the approach described in relevant CEA Agency guidance documents by considering the impact of the Project in combination with other past, present and future activities in the region upon each VC. As is the case with the assessment of intra-Project effects, an ecosystem approach has been adopted. The results of this assessment are set out in Chapter 15 of the EIS.***	***Section 15.1***
Engagement • ***ongoing communications*** • ***capacity funding*** • ***impacts on Indigenous rights***	• ***Equinor Canada is committed to continuing to provide opportunities to Indigenous groups for information-sharing and exchange as requested or required in the post-EIS period in order to discuss issues and concerns. The specifics of engagement processes will be developed through discussions with the various groups. As appropriate, Indigenous groups will be engaged during the development of follow-up monitoring programs.*** • ***Questions related to the provision of capacity funding to enable Indigenous groups to participate in the environmental assessment process are referred to the CEA Agency.***	***Section 14.1.4*** ***Section 14.1.5***

	• ***It is Equinor Canada's understanding that none of the Indigenous groups listed in the EIS Guidelines have asserted or established Indigenous rights to, in or near the LSA. However, Equinor Canada will continue to engage with Indigenous groups to further understand if there are any potential adverse impacts to Indigenous rights.***	
Commercial fisheries • ***Mitigation*** • ***Compensation***	***While baseline information respecting Indigenous commercial communal fishers details commercial fishing activities undertaken in or near the Project area, the assessment of impacts of the Project upon fish and fish habitat will consider both impacts from operations and accidental events throughout the RSA. If an effect on species might have an indirect effect on communal commercial fishing outside the Project area that will be noted. Should a fisher experience loss or damage as a result of either routine Project activities or accidents, losses will be compensated through a program which will be developed in consideration of the C-NLOPB's guidelines (founded on the Canada-Newfoundland and Labrador Atlantic Accord Implementation Acts).*** ***In addition to the compensation programs, mitigation measures applicable to commercial fishers which are identified in the EIS include:*** • ***Ongoing communication with commercial fishers 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) 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*** • ***Implementation of a standard marine communication protocol to promote safe practices between commercial fishing enterprises, other marine users and BdN operations.***	***Section 7.1*** ***Section 14.1.5***

	• ***Issuance of Notices to Shipping and Notices to Mariners (where appropriate) regarding planned Project activities***	
Fish and Fish Habitat • ***Data collection – new data for corals and sponges*** • ***Effects of discharges on corals and sponges*** • ***Use of dispersants*** • ***Fish taint – prey species*** • ***Invasive species***	***Equinor Canada has completed a seabed survey (detailed in Section 6.1.1.5) to provide a better dataset for assessing coral and sponge densities in the Project Area. 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.*** ***No significant effects upon sponges and corals associated with discharges are predicted. However, Equinor Canada will employ mitigation measures designed to reduce potential impacts to marine ecosystems, including VMEs. 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. In addition, Equinor Canada has also committed to measures which are not industry standard offshore NL – e.g., the use of cuttings transfer system to relocate water-based cuttings discharges, as listed in Section 9.1.5.2. This mitigation is widely used offshore Norway in sensitive areas where coral reefs and colonies are present. 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). An Environmental Effects Monitoring program will be developed to monitor the efficacy of mitigation measures.*** • ***There are two spill-treating agents (dispersants) approved for use in Canada. The approval process for these spill-treating agents considered their toxicity. Information on the environmental effects of dispersants is provided in Sections***	***Section 2.8.2*** ***Section 6.1.1.5*** ***Section 9.1.5.2*** ***Section 16.7.4*** ***Section 16.7.4.4*** ***Section 16.7.5.4*** ***Section 16.7.6.5*** ***Section 16.7.8.2*** ***Appendix N*** ***Appendix O***

	16.7.4.4; 16.7.5.4, 16.7.6.5, and 16.7.8.2 of the EIS. 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. • ***Effects of a release of hydrocarbons on fish and fish habitat (including prey species) and associated effects on commercial fisheries and Indigenous peoples are discussed in Chapter 16.*** • ***Equinor Canada considers prevention to be key in controlling the introduction and spread of aquatic invasive species. Although the likelihood that a Project vessel will result in the introduction and spread of an invasive species is relatively low, ballast water will be managed in consideration of applicable Canadian and international ballast water management requirements to reduce the potential spread of invasive species. Ballast water management is addressed in Chapter 2 and potential effects of ballast water are discussed in Chapter 9.***	
Traditional Knowledge	***With respect to Indigenous Knowledge, Equinor Canada has invited each group to share Indigenous Knowledge relevant to the Project and EIS through the negotiation of agreements or through the sharing of previous reports or existing databases. While there has been no uptake of these offers to date, to supplement its understanding of relevant Indigenous Knowledge acquired during regular engagement activities, Equinor Canada commissioned a desktop Indigenous Knowledge Study (Appendix H), summarizing publicly available information relating to Indigenous Knowledge. As relevant and appropriate, the various EIS chapters incorporate traditional knowledge provided during engagement activities or set out in the desktop Indigenous Knowledge Study (Appendix H).***	***Appendix H***

Special Areas – • **Need to include full listing of all existing and proposed MPAs as well as NAFO divisions, vessel traffic routes and crab areas** • **Species presence – northern bottlenose whale** • **Figures should show NAFO division, crab area and vessel traffic routes**	• ***Special Areas are discussed in Chapter 12. Special areas are those areas which have been identified by Canadian and International regulatory bodies based on defining environmental features including the presence of sensitive habitats, supporting life stages of marine and/or migratory species and/or the presence of fish, marine mammals, marine birds, etc. The EIS includes the consideration of identified special areas within the Project RSA, as applicable. Figures are included which show the location of Special Areas in relation to Project Area and other key items such as NAFO Divisions, vessel traffic routes, licences and other production facilities.*** • ***Baseline information respecting species observed in Special Areas, including the northern bottlenose whale, is set out in Chapter 6 and potential effects upon fish and fish habitat, marine mammals and migratory birds within Special Areas are identified and assessed in Chapter 12.***	***Section 6.3.7.5*** ***Section 12.1.5***
Effects of environment on Project – sea icing on FPSO	***In order for sea spray icing or atmospheric icing to occur, certain meteorological conditions (wind, humidity, precipitation, temperature) must be present. The FPSO is designed in accordance with recognized standards to handle certain extreme icing loads, including the buildup of ice, should it occur. Operating experience for other drilling and production facilities in the offshore area indicates that the observed icing is significantly less than allowed in the design of the facilities. However, if the meteorological conditions are present, visual monitoring for the buildup of icing will be carried out, and if required, the ice will be removed.*** ***Effects of the environment on the Project are described and assessed in Chapter 17.***	***Section 17.3.3***
Assessment Methodology – need for ecosystem approach	***Equinor Canada has adopted an ecosystem approach to the environmental assessment of the Bay du Nord Project. 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***	***Section 1.4***

	been assessed in consideration of the interactions and inter-relationships between VC's. The interconnections between the physical, biological and human environment have been considered in the EIS and are summarized in each respective VC chapter. Overall the EIS is based on the interactions between project activities and select VC's using source-pathway-receptor relationships. 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 impact significance determinations, as the potential effects (via direct and indirect pathways) on each VC has been assessed.	

BAY DU NORD DEVELOPMENT PROJECT CEAR #80154
OCTOBER WORKSHOP REPORT

December 14, 2018

Bay du Nord Development Project CEAR #80154
Report on October 2018 Workshops

Background

In mid-October, 2018, Equinor Canada (Equinor) held three ½ day workshops (the Workshops) specifically focussed on the potential environmental effects and proposed mitigation measures associated with the Bay du Nord Development Project, CEAR #80154 (the Project). The Workshops were held in St. John's, NL (October 11th), Quebec City, QC (October 16th) and Moncton, NB (October 19th). Each Workshop was immediately preceded by a 1-day session in the particular location held by 5 Operators (Nexen Energy ULC, BP Canada Energy Group ULC, Husky Oil Operations Ltd, ExxonMobil Canada Ltd and Equinor Canada) to discuss aspects of the various ongoing Exploration Drilling programs in the Flemish Pass and other areas in the offshore.

Each of the Indigenous groups listed in Bay du Nord Environmental Impact Statement Guidelines (the Guidelines) issued by the Canadian Environmental Assessment Agency on September 26, 2018 were invited to attend one Workshop in a convenient location. Representatives of the following Indigenous groups participated in the Workshops:

- Mi'gmawe'l Tplu'taqnn Incorporated
- Elsipogtog First Nation
- Wolastoqey Nation in New Brunswick
- Peskotomuhkati Nation at Skutik
- Mig'mawei Mawiomi Secretariat
- Première Nation des Innus de Nutashkuan
- Innu Nation
- Nunatsiavut Government
- NunatuKavut Community Council
- Miawpukek First Nation

In addition, Shared Value Solutions and The First Nations of Quebec and Labrador Sustainable Development Institute (FNQLSDI) also participated in the Workshops. A representative of CEAA attended each Workshop.

Approach and Methods

The Workshops were based on materials prepared by Equinor, including a power point presentation and individual worksheets. Each worksheet focussed on one of the following 7 Valued Components (VCs) identified in the Guidelines:

- Atmospheric Environment
- Marine Fish and Fish Habitat
- Marine and Migratory Birds
- Marine mammals and Sea Turtles
- Special Areas
- Marine Fisheries and other Ocean Users
- Effects of the Environment on the Project

The predicted environmental effects of each phase of the Project upon the specific VC and associated proposed mitigation measures as identified by Equinor were set out in the individual worksheets. All materials were translated into French. Materials used at the Workshop will be included in an appendix to the EIS.

Each Workshop began with the delivery of a brief power point presentation and video providing updated information on the Project and relevant regulatory processes. The remainder of the Workshop was devoted to a discussion of the worksheets. To facilitate this discussion, participants at the St. John's and Moncton Workshops were divided into breakout groups (3 – 4 individuals, including a representative of Equinor Canada) and each group was assigned 2 or 3 VCs for consideration. Breakout groups were asked to review the identified environmental effects and mitigation measures for accuracy and completeness, note any gaps and recommend additions and revisions. Groups were also invited to propose mitigation measures and strategies directed at identifying and addressing potential interactions with Indigenous groups (specifically, impacts on rights, health and socio-economic conditions, culture and heritage and current use of land and resources for traditional purposes). Each group prepared a short report on its findings and recommendations which was then presented to the larger group for discussion. Due to the small number of participants in Quebec City, the potential effects and mitigation measures associated with VCs of particular interest were discussed by the group as a whole.

Since not all Indigenous groups were able to attend the Workshops, following the conclusion of the sessions, Equinor transmitted electronic copies of all workshop materials to each Indigenous group listed in the Guidelines together with an invitation to provide additional comments. Comments received in response to this invitation have been included in this Report.

The results of the Workshops have been summarized and consolidated into this Report (characterized as comments or recommendations). Comments and recommendations have not been attributed to any identified Workshop participant or Indigenous group but are organized by reference to VC and subject-matter. It is Equinor's intention to include the Workshop report as an Appendix to the EIS and comments and recommendations will be integrated into the relevant chapters of the EIS where appropriate.

Summary of Workshop Discussion

A. General Comments

Generally, the Workshop format was well received. However, participants who completed evaluation forms indicated that a full day workshop would be more effective and encourage a more robust discussion/consideration of materials. In addition, it was recommended that Workshop materials such as the Worksheets be circulated in advance to allow participants time to review. With respect to Workshop Materials, participants found the Project video and power point to be informative. The general content of the Worksheets was characterized as clear and helpful – however all participants indicated that most of the identified environmental interactions would be relevant during all phases of the Project. In addition, although not associated with any specific VC, participants expressed interest in learning more about Equinor and its global offshore activities, employment opportunities associated with the Bay du Nord project, studies undertaken by Equinor in support of the EIS and other regulatory processes applicable to Project approval. A general theme expressed by participants was the need for ongoing engagement with Indigenous groups and the value of collection and integration of Indigenous Knowledge into the EIS and generally throughout the EA process.

B. Specific VC Comments

The following sections set out the various comments/recommendations made by the representatives of the Indigenous Groups listed in the Guidelines who participated in the Workshops. These are organized by reference to specific VCs without attribution to named participants or groups. Where appropriate comments/recommendations have been further classified by reference to specific subject-matters. Responses provided by Equinor follow the specific comment.

1. VC - Atmospheric Environment

a. **Fuel combustion**:
   - Comment: Will there be a commitment to BATA (Best Available Technology) in the EIS?
     Equinor Response: Yes

- Comment: Will there be a commitment to minimize overall emissions?
  Equinor Response: Yes

- Comment: Has Equinor considered diesel emissions and new BlueTec technology used by Mercedes Benz and others?
  Equinor Response: Equinor will likely not propose that technology

b. **Cumulative Effects**
   - Comment: Is it likely that seismic programs could affect salmon migration patterns?
     Equinor Response: This is highly unlikely as disturbance will only be temporary.

   - Recommendation: Equinor needs to take into account air emissions associated with implementation of provincial Advance 2030 Program.

c. **Climate Change**:
   - Comment: What about the potential impact on climate change? How does this Project relate to Canada's global commitment to reduce GHGs? If the project proceeds, each barrel will have an indirect effect on GHG emissions.
     Equinor Response: Equinor is committed to sustainable development and to low carbon. It is government's decision whether project will be permitted to proceed and consideration of contribution to climate change will be one criterion in making that determination.

d. **Indigenous Peoples Interactions**
   - Recommendation: EIS should focus on the shoreline to determine potential interactions.
     Equinor Response: EIS will consider interactions both in the Project Area and the RSA (which for Indigenous peoples includes the entirety of the Atlantic region).

   - Comment: Groups are generally concerned with the potential impacts of atmospheric emissions on salmon, American eel and Right Whales.
     Equinor Response: Potential effects upon these species will be considered in the EIS.

   - Comment: If there are no stationary air monitoring stations, the ongoing effect of atmospheric conditions is unknown.
     Equinor Response: Air emissions modelling undertaken for the EIS may provide insights.

   - Comment: If there is a spill and in-situ burning and VOC evaporation occurs, will this have an effect on coastal communities?
     Equinor Response: This will be considered in EIS.

2. VC - Marine and Migratory Birds

a. **Lighting**:
- Recommendation: EIS should elaborate on bird deterrent technology.
  Equinor Response: Bird deterrent technology will be discussed in the EIS but Equinor does not plan to use Bird Deterrents during routine operations.

- Recommendation: There should be third party representatives for routine bird searches and monitoring programs.

- Recommendation: If lighting reductions are implemented, these should be compared to other offshore production facilities to determine their effectiveness.

b. **Flaring**:
- Comment: Are bird migration times and possible interactions with prey species factored into Project schedule?
  Equinor Response: No, not for flaring as routine flaring will not be conducted.

- Recommendation: If pilot flare is selected, this should be incorporated into the Bird Observation Program.
  Equinor Response: Yes, if a pilot flare is selected this will be considered in the design of the bird observation program.

c. **Sound**:
- Comment: Has CWS looked into the effect of seismic on diving birds?
  Equinor Response: Equinor does not know whether CWS has done any research/investigation into this matter.

d. **Produced Water Discharge**:
- Recommendation: Equinor should commit to the Best Available Technology and Best Practices to deal with produced water.
  Equinor Response: Equinor's commitment to best available technology and best practices generally will be discussed in the EIS.

- Recommendation: If a sheen is observed, Equinor should consider deploying booms.

- Recommendation: Equinor should consider the effect on sediment surface for materials that are originally liquid but may turn to solids and accumulate on the seabed.

- Comment: Are there any safety issues associated with breaking down H2O (into hydrogen and oxygen) before discharging produced water?

e. **Presence of Production Ship**:
   - Recommendation: If Bird Deterrents are used, they should be localized so as not to affect birds farther away.
     Equinor Response: Equinor does not plan to use bird deterrents during routine operations.

f. **Discharges to Marine Environment**:
   - Recommendation: Equinor should commit to best treatment practices.
     Equinor Response: This will be discussed in the EIS.

g. **Helicopter and Vessel Transit**:
   - Comment: Has Equinor considered timing restrictions to avoid interference during nesting period?

h. **Accidental Events**:
   - Comment: The EIS should include the scenario involving spills from transiting vessels.
     Equinor Response: This will be considered in the EIS.

i. **Cumulative Effects**:
   - Recommendation: If a new, unanticipated production facility is planned within 100 km of the proposed Bay du Nord, it will need to be assessed.

   - Recommendation: Equinor needs to take into account air emissions associated with implementation of provincial Advance 2030 Program.

j. **Interactions with Indigenous Peoples**:
   - Recommendation: Ensure review process is implemented to confirm that processes are being followed.
     Equinor Response: There will be an Environmental Effects Monitoring Program (EEM) designed for the Project.

   - Recommendation: There should be communication with all Indigenous Groups in the event of a major spill.
     Equinor Response: The EIS will address this matter.

   - Recommendation: All groups should be involved in the development of a communication plan/protocol.
     Equinor Response: The EIS will address this matter.

- Recommendation: If a major spill occurs, there should be local monitoring in coastal areas by relevant Indigenous Groups.

- Recommendation: Equinor should continue to stay on top of best practices and new technology throughout the life of the Project

3. VC - Marine Mammals and Sea Turtles

- Comment: What are the standard mitigations if marine mammals observed in area?
  Equinor Response: Equinor will comply with all regulatory standards.

- Recommendation: There is a need for training of marine mammal observers and fisheries liaison officers.

- Comment: Can sound kill?
  Equinor Response: Yes, but the potential adverse effects of sound on marine mammals and fish will be mitigated by ramp-up.

- Recommendation: The EIS needs to reflect the significance of marine mammals and seals to Indigenous groups – in particular, whales, walrus and seal are significant (Inuit) for food, social and ceremonial purposes.
  Equinor Response: The EIS will take into account the cultural importance of identified marine mammals

- Recommendation: Vessel traffic needs to be addressed – develop mitigations applicable to encounters between vessels and marine mammals.
  Equinor Response: The EIS will address this point.

- Recommendation: There is a need for continuous monitoring of discharges and for an onboard physical observer.
  Equinor Response: Equinor will follow all relevant regulatory guidelines and submit regular compliance and monitoring reports to the C-NLOPB.

- Recommendation: There should be regular reporting to the communities. Equinor and communities should work together to develop a communications protocol.
  Equinor Response: This will be considered in the EIS.

- Recommendation: EIS should take into account the cultural importance of right whales and seals.
  Equinor Response: The EIS will take into account the cultural importance of identified marine mammals.

- Comment: There is a need for effective monitoring programs.

- Recommendation: there should be automatic sensors on platforms to detect the presence of migratory birds.
  Equinor Response: Equinor is investigating the use of technology such as avian radar to monitor the presence of migratory birds.

4. VC - Marine Fish and Fish Habitat

a. **General**:
   - Comment: Need to recognize the links (biological and otherwise) between the ocean and the St. Lawrence seaway and the importance of these links for understanding of Project impacts on marine mammals and fish.

   - Comment: Need to understand that while there are species of traditional/cultural/spiritual importance to all groups (e.g. salmon), there are also species which are of commercial importance.
     Equinor Response: The EIS will address this matter.

   - Recommendation: Protect water at all costs – all sea creatures are important and must be protected.

   - Comment: There is concern that the presence of the production ship and drill rig may create temporary habitat and attract invasive species.

b. **Data**:
   - Comment: There are clear data gaps, so it is difficult to find answers to many concerns. It is important to take an ecosystem approach and to use the most up-to-data data.

   - Recommendation: Equinor should support university/Indigenous groups in collection of data samples.

c. **Oil Spill Response Plan**:
   - Recommendation: The Oil Spill Response Plan needs to factor in the human element.
     Equinor Response: Equinor is committed to a culture of safety – all are encouraged to report safety violations and stop work in unsafe conditions without fear of reprisal. Equinor's goal is to prevent rather than to react to accidents so there will be extensive and regular training.

- Recommendation: There should be a local capping stack (e.g., along Canadian eastern seaboard) or Equinor should have its own capping stack specific to the Bay du Nord Project.

- Comment: Is the Oil Spill Response Plan subject to periodic review and updating?
  Equinor Response: yes, the plan is subject to continuous review and revision where required.

d. **Sponges and Coral:**
   - Comment: Will there be any new data collected by Equinor (specific to sponges and coral and benthic data) or will the EIS rely on existing data?
     Equinor Response: A coral survey has recently been completed and the results will be included in the EIS. With respect to benthic data, Equinor will use existing data but will also collect new data before disturbing the seabed. There will also be follow-up and monitoring and Indigenous groups will be engaged to seek input on terms of follow-up.

e. **Sound**:
   - Recommendation: A major concern is cumulative effects so need to work with other operators to gather data on effects of sound on fish and other species.

   - Recommendation: Need for more data to understand impact of sound on salmon migration patterns.

   - Recommendation: Need to collect data on impact of sound on all potentially affected species.

   - Recommendation: To the extent possible, avoid critical times – migration and feeding times of salmon.

f. **Accidental Events**:
   - Comment: What is the effect of dispersants on fish?
     Equinor Response**:** The EIS will address this matter.

   - Recommendation: Prey species (food source for salmon) should be tested for the presence of taint.

   - Comment: Are any hazardous chemicals kept on board the FPSO or drill rig? If so, what are they used for? Equinor should provide a list of all on-board hazardous materials.

g. **Cumulative Effects**:
   - Recommendation: Cumulative effects should be periodically assessed – recommend assessment in 5-year increments.

   - Recommendation: Need for a global perspective on offshore development. Current EA process is deficient as project-focussed. While there are regional assessments ongoing or proposed for the offshore, these are deficient because they are limited to the offshore and do not consider impacts on potentially affected lands and waterways.

   - Comment: The quality of cumulative effects assessment for fish and generally is problematic – just an add-on to Project-specific assessment.

   - Comment: It is difficult to predict cumulative effects, particularly on salmon, due to data gaps.

h. **Interactions with Indigenous Groups:**
   - Recommendation: Need for better data collection to determine baseline species health for those species harvested by Indigenous peoples (FSC and communal commercial). Current data is dated and has many gaps.

   - Comment: Equinor needs to understand that fisheries is significant for the entire community – communal commercial fisheries do not benefit just the individual fisher but the entire community and revenues from communal commercial fisheries may be used to fund or supplement existing social programs in the community. As a result, any adverse impact on these species is experienced by entire community.

   - Comment: Proponents need a better understanding of cultural, spiritual and traditional importance of certain species at the earliest stage in a project's design and planning. Traditional knowledge needs to be integrated into the EA process as soon as possible. Too often, traditional knowledge is not collected or considered until after the EIS has been submitted.

   - Recommendation: There is a need for early and regular consultation with Indigenous groups to ensure their concerns and potential impacts on asserted and established rights are understood.

   - Recommendation: Salmon is a species of critical importance so there should be a study on salmon.

- Comment: There is concern about potential contamination of fish from oil spill. This has a psycho-social impact which may result in loss of confidence in species. There may also be long-term socio-economic effects. Have there been any studies respecting long-term impacts of spills on fish?
  Equinor Response: Equinor is aware of this concern and has conducted spill modelling to determine likely trajectory of spills and potential impacts on fish and marine life and habitat. Equinor has reviewed relevant studies and the EIS will contain a separate chapter on Accidental Events.

- Comment: With respect to physical and cultural heritage, Equinor needs to understand that current FSC species may not necessarily reflect what an Indigenous Group may choose to use in future. For example, crab was not necessary a traditional food stuff but is now consumed by younger generation.

- Comment: Indigenous groups maintain fishing licences overlapping/adjacent to the Project Area. Fish are harvested both commercially and as a source of traditional food. The potentially adverse effects from project activities could impact the use of these resources. Marine areas have been traditionally used by Mi'kmaq people as a source of medicinal plants and animals, food, and travel ways. There is also a cultural, spiritual and social importance of the Earth and its natural resources. Atlantic salmon are a species of special concern. They are important to the Mi'kmaq people historically, culturally, and for means of sustenance. The potential environmental effects as a result of activity in the project area may impact the migration patterns of this species.

5. VC - Marine Fisheries and other Ocean Users

a. **Scope of Assessment**:

- Comment: Is the assessment of commercial fisheries limited to the Project area or is it regional?
  Equinor Response: The baseline will look at commercial fishing activities undertaken in or near the Project area. However, the assessment of impacts of the Project upon fish and fish habitat will consider both impacts from operations and accidental events so if an effect on species might have an indirect effect on communal commercial fishing outside the Project area that will be noted.

- Comment: Assessment should take into account the change in species distribution as this may affect fishing patterns – some communities noted invasive species such as striped bass which have adversely affected local commercial fisheries.

b. **Mitigations**:

- Comment: What are the main mitigations on adverse impacts on commercial fisheries?
  Equinor Response: compensation guidelines and communications with fishers and marine users.

- Recommendation: Any compensation plan or guideline must address compensation reflective of the significance of affected species to Indigenous groups.

- Comment: There is a need for specificity as to how compensation is quantified. How do you quantify a cultural loss?

- Recommendation: Indigenous groups need to be involved in the development of compensation guidelines.

6. VC - Special Areas

- Recommendation: Figures should show NAFO divisions, crab area and vessel traffic.
  Equinor Response: These figures will be included in the EIS.

- Recommendation: Equinor should try and obtain a list of all proposed MPAs from DFO to get some sense of what is important in the offshore area.
  Equinor Response: Equinor will have access to all publicly available information re: MPAs and will consider this in the EIS.

- Comment: Have northern bottlenose whales been seen in or near the proposed Project area? If they have been seen in the area, it is important to identify the habitat as it tends to be specific. Perhaps DFO could supply this information. There is concern due to VSPs/seismic testing so that use of Passive Acoustic Monitoring may be required.

7. VC - Effects of the Environment on the Project

- Comment: How is sea icing on the FPSO handled?
  Equinor Response (provided after the Workshop): In order for sea spray icing or atmospheric icing to occur, certain meteorological conditions (wind, humidity, precipitation, temperature) must be present. The FPSO is designed in accordance with recognized standards to handle certain extreme icing loads, including the buildup of ice, should it occur. Operating experience for other drilling and production facilities in the offshore area indicates that the observed icing is significantly less than allowed in the design of the facilities. However, if the meteorological conditions are present, visual monitoring for the buildup of icing will be carried out, and if required, the ice will be removed.

APPENDIX B:

INFORMATION TO SUPPORT RESPONSE TO IR-32/CONFORMITY DFO-1

Table 1: Ecosystem Linkages Marine Fish and Fish Habitat

Component/Activity	Interaction	Pathway	Ecosystem Linkages
Offshore Construction and Installation, Hook-Up and Commissioning (in Core BdN and Potential Future Development)			
Presence of Vessels	• Light • Sound • Discharges and emissions	**Core BdN and Potential Future Development – PA** • Migrating individuals, plankton, and pelagic species may be attracted to the lighting effect on the surface water caused by lights reflecting off water surface, and invertebrates may become attached to the subsea structure as it provides a surface for colonization • Anthropogenic sound is transmitted through the water and seabed and may result in disturbances to marine biota • Marine discharges could result in behavioural changes for mobile fish and invertebrates. • Air emissions are not anticipated to affect Marine Fish and Fish Habitat due to the lack of an effect pathway.	Avoidance/attraction behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles; and change in abundance, distribution and quality of marine fish in commercial-communal harvesting areas.
Installation of subsea infrastructure	• Disturbance of the seafloor and benthic habitats and fauna • Suspended sediments and introduction of sediments of different shapes and sizes	**Core BdN and Potential Future Development – PA** • These activities may result in exposure, injury, burial and/or mortality of benthic organisms if present. • Suspended sediment may clog feeding structures of filter-feeding organisms (e.g. corals, sponges and sea pens)	Benthic habitats provide refuge for small planktonic and benthic invertebrates. Damage to, or mortality of, benthic species could result in loss of refugia and change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
HUC Activities	• Light • Sound • Discharges and air emissions	**Core BdN and Potential Future Development – PA** • Migrating individuals, plankton, and pelagic species may be attracted to the lighting effect on the surface water caused by lights reflecting off water	Avoidance/attraction behaviours could result in change in food availability and quality for larger marine fish, marine and migratory

	• Marine discharges	surface, and invertebrates may become attached to the subsea structure as it provides a surface for colonization • Anthropogenic sound is transmitted through the water and seabed and may result in disturbances to marine biota • Marine discharges could result in behavioural changes for mobile fish and invertebrates. • Air emissions are not anticipated to affect Marine Fish and Fish Habitat due to the lack of an effect pathway.	birds and marine mammals and sea turtles; and change in abundance, distribution and quality of marine fish in commercial-communal harvesting areas.
Production and Maintenance Operations (in Core BdN and Potential Future Development)			
Presence of FPSO and Subsea Infrastructure	• Light • Sound	**Core BdN and Potential Future Development – PA** • Migrating individuals, plankton, and pelagic species may be attracted to the lighting effect on the surface water caused by lights reflecting off water surface, and invertebrates may become attached to the subsea structure as it provides a surface for colonization • Anthropogenic sound is transmitted through the water and seabed and may result in disturbances to marine biota	Avoidance/attraction behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles; and change in abundance, distribution and quality of marine fish in commercial-communal harvesting areas.
Waste Management	• Produced water • Other waste discharges	**Core BdN and Potential Future Development – PA** • Produced water could result in behavioural changes (attraction or avoidance) for mobile fish and invertebrates • Produced water discharges could result in changes in fish and invertebrate health, injury or mortality • Other waste discharges (e.g., food or septage waste) could result in behavioural changes (attraction or avoidance) for mobile fish and invertebrates. • Air emissions are not anticipated to affect Marine Fish and Fish Habitat due to the lack of an effect pathway.	Attraction or avoidance behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles; and change in abundance, distribution and quality of marine fish in commercial-communal harvesting areas.
Drilling Activities (in Core BdN and Potential Future Development)			

Presence of Drilling Installation	• Light • Sound	**Core BdN and Potential Future Development – PA** • Migrating individuals, plankton, and pelagic species may be attracted to the lighting effect on the surface water caused by lights reflecting off water surface, and invertebrates may become attached to the subsea structure as it provides a surface for colonization. • Anthropogenic sound is transmitted through the water and seabed and may result in disturbances to marine biota	Attraction or avoidance behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles; and change in abundance, distribution and quality of marine fish in commercial-communal harvesting areas.
Waste Management	• Drill cuttings • Other waste discharges	**Core BdN and Potential Future Development – PA** • Discharge of SBM and WBM cuttings could result in increased larval mortality and change in feeding behaviour of benthic species up to 200 m from drill site. • Suspended sediment could clog the feeding structures of filter-feeding organisms (e.g. corals, sponges and sea pens) • Deposition of drill cuttings could result in mortality of benthic species through burial, up to 200 m from drill site. • Other waste discharges (e.g., food or septage waste) could result in behavioural changes (attraction or avoidance) for mobile fish and invertebrates. • Air emissions are not anticipated to affect Marine Fish and Fish Habitat due to the lack of an effect pathway.	Benthic habitats provide refuge for small planktonic and benthic invertebrates. Damage to, or mortality of, benthic species could result in loss of refugia and change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.

Supply and Servicing (in Core BdN and Potential Future Development)			
Marine Vessels	• Vessel traffic • Light emissions • Sound emissions	**Core BdN and Potential Future Development – PA** • Migrating individuals, plankton, and pelagic species may avoid or be attracted to the lighting effect on the surface water caused by lights reflecting off water surface • Anthropogenic sound from vessels is transmitted through the water and seabed and may result in disturbances to marine biota.	Avoidance/attraction behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles; and change in abundance, distribution and quality of marine fish in commercial-communal harvesting areas.
Supporting Surveys (in Core BdN and Potential Future Development)			
Geophysical	• Presence of vessels • Lighting • Sound	**Core BdN and Potential Development – PA** • Migrating individuals, plankton, and pelagic species may avoid or be attracted to the lighting effect on the surface water caused by lights reflecting off water surface • Anthropogenic sound from vessels is transmitted through the water and seabed and may result in disturbances, injury or mortality to marine biota • Presence of vessels, lighting and sound could result in behavioural changes (attraction or avoidance) by mobile fish and invertebrates.	Avoidance/attraction behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles; and change in abundance, distribution and quality of marine fish in commercial-communal harvesting areas.
Env, Geotech, Geo and ROV/AUV	• Presence of vessels • Lighting • Sound • Contact with seabed	**Core BdN and Potential Development – PA** • Migrating individuals, plankton, and pelagic species may avoid or be attracted to the lighting effect on the surface water caused by lights reflecting off water surface • Anthropogenic sound from vessels is transmitted through the water and seabed and may result in disturbances to marine biota • Contact with seabed may result in exposure, injury, burial and/or mortality of benthic organisms, if present. • Suspended sediment may clog feeding structures of filter-feeding organisms (e.g. corals, sponges and sea pens)	Attraction or avoidance behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles; and change in abundance, distribution and quality of marine fish in commercial-communal harvesting areas.

		• Presence of vessels, lighting and sound could result in behavioural changes (attraction or avoidance) by mobile fish and invertebrates.	Damage to, or mortality of, benthic species could result in loss of refugia and change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Decommissioning (in Core BdN and Potential Future Development)			
Decommissioning	• Decommissioning of FPSO • Removal of subsea infrastructure • Well decommissioning	**Core BdN and Potential Future Development – PA** • Removal of subsea infrastructure will result in decline is sessile or low-mobility benthic invertebrates that were supported by the infrastructure • Suspended sediment could clog the feeding structures of filter-feeding organisms (e.g. corals, sponges and sea pens)	Damage to, or mortality of, benthic species could result in loss of refugia and change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.

Table 2: Ecosystem Linkages Marine and Migratory Birds (including SAR)

Component/Activity	Interaction	Pathway	Ecosystem Linkages
Offshore Construction and Installation, Hook-Up and Commissioning (in Core BdN and Potential Future Development)			
Presence of Vessels	• Light • Sound • Discharges and emissions	**Core BdN and Potential Future Development – PA** • Attraction of nocturnally-active birds may result in direct mortality or injury through collisions with vessels, predation, or stranding. • Disorientation due to attraction may also increase energy expenditure which can have negative impacts on survival rates, particularly for migrating birds. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels. • The discharge of organic wastes may attract birds.	Avoidance/attraction behaviours of prey species such as fish and invertebrates could result in change in food availability and quality for marine and migratory birds, larger marine fish and marine mammals and sea turtles.
HUC Activities	• Light • Sound • Discharges and emissions	**Core BdN and Potential Future Development – PA** • Attraction of nocturnally-active birds may result in direct mortality or injury through collisions with vessels, predation, or stranding. Disorientation due to attraction may also increase energy expenditure which can have negative impacts on survival rates, particularly for migrating birds. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels. • The discharge of organic wastes may attract birds.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for marine and migratory birds, larger marine fish and marine mammals and sea turtles.
Production and Maintenance Operations (in Core BdN and Potential Future Development)			
Presence of FPSO and Subsea Infrastructure	• Light • Sound	**Core BdN and Potential Future Development – PA** • Attraction of nocturnally-active birds may result in direct mortality or injury through collisions with facility infrastructure including flares, predation, or stranding on the platforms. Disorientation due to attraction may also increase energy expenditure which can have negative impacts on survival rates, particularly for migrating birds. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of offshore platforms.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for marine and migratory birds, larger marine fish and marine mammals and sea turtles.

		• Minor displacement of birds from foraging areas may occur due to presence of FPSO.	
Waste Management	• Produced water • Other waste discharges • Air emissions including flaring	**Core BdN and Potential Future Development – PA** • Contact with sheens occurring due to produced water may result in mortality and sublethal effects on seabirds, due to toxicity and/or disruption of the waterproofing and insulating properties of feathers. • Organic waste discharges (food and sewage waste) may result in attraction of birds to vessels and platforms. • Flaring may attract or disorient nighttime-flying birds, which may result in mortality or injury to marine and migratory birds.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for marine and migratory birds, larger marine fish and marine mammals and sea turtles.
Drilling Activities (in Core BdN and Potential Future Development)			
Presence of Drilling Installation	• Light • Sound	**Core BdN and Potential Future Development – PA** • Attraction of nocturnally-active birds may result in direct mortality or injury through collisions with facility infrastructure including flares, predation, or stranding on the platforms. Disorientation due to attraction may also increase energy expenditure which can have negative impacts on survival rates, particularly for migrating birds. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of offshore platforms.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for marine and migratory birds, larger marine fish and marine mammals and sea turtles.
Waste Management	• Drill cuttings • Other waste discharges • Air emissions	**Core BdN and Potential Future Development – PA** • With appropriate selection of chemicals (including use of non-toxic drilling fluids), and proper disposal, effects on birds due to disposal of drill muds and cuttings and associated waste materials are considered unlikely. • Organic waste discharges (food and sewage waste) may result in attraction of birds to vessels and platforms.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for marine and migratory birds, larger marine fish and marine mammals and sea turtles.
Supply and Servicing (in Core BdN and Potential Future Development)			
Marine Vessels	• Vessel traffic • Light emissions • Sound emissions	**Core BdN and Potential Future Development – PA** • Attraction of nocturnally-active birds may result in direct mortality or injury through collisions with vessels, predation, or stranding. Disorientation due to attraction may	Avoidance/attraction behaviours of prey species could result in change in food

		also increase energy expenditure which can have negative impacts on survival rates, particularly for migrating birds. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels.	availability and quality for marine and migratory birds, larger marine fish and marine mammals and sea turtles.
Aircraft (helicopters)	• Presence	**Core BdN and Potential Future Development – PA** • At low altitudes (during takeoff and landing), presence of helicopters may result in disruptions to marine and migratory birds due to the presence of the helicopter. Disruptions may result in temporary loss of useable habitat, increased energy expenditure due to escape reactions and lower food intake due to interrupted foraging or disruption of migratory activities. • Avoidance of seabird breeding colonies during critical times (as outlined in *Seabird Ecological Reserve Regulations*, 2015) will ensure no disturbance of nesting seabirds.	Avoidance behaviours could result in temporary change in food availability and quality for marine and migratory birds and marine mammals and sea turtles during takeoff and landing.
Supporting Surveys (in Core BdN and Potential Future Development)			
Geophysical	• Presence of vessels • Lighting • Sound	**Core BdN and Potential Future Development – PA** • Attraction of nocturnally-active birds may result in direct mortality or injury through collisions with vessels, predation, or stranding. Disorientation due to attraction may also increase energy expenditure which can have negative impacts on survival rates, particularly for migrating birds. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels. Physical effects (i.e. auditory injury) on diving birds from seismic surveys are unlikely and limited to a small area around the air source array.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for marine and migratory birds, larger marine fish and marine mammals and sea turtles.
Env, Geotech, Geo and ROV/AUV	• Presence of vessels • Lighting • Sound	**Core BdN and Potential Future Development – PA** • Attraction of nocturnally-active birds may result in direct mortality or injury through collisions with vessels, predation, or stranding. Disorientation due to attraction may also increase energy expenditure which can have negative impacts on survival rates, particularly for migrating birds. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels.	Attraction or avoidance behaviours of prey species could result in change in food availability and quality for larger marine fish, marine and migratory birds and

			marine mammals and sea turtles. Damage to, or mortality of, benthic plants, fish and invertebrate species could result in loss of refugia and change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Decommissioning (in Core BdN and Potential Future Development)			
Decommissioning	• Decommissioning of FPSO	**Core BdN and Potential Future Development – PA** • Attraction of nocturnally-active birds may result in direct mortality or injury through collisions with vessels, predation, or stranding. Disorientation due to attraction may also increase energy expenditure which can have negative impacts on survival rates, particularly for migrating birds. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels. • Removal of FPSO may restore habitat for foraging seabirds.	Damage to, or mortality of, benthic plants, fish and invertebrate species could result in loss of refugia and change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.

Table 3: Ecosystem Linkages Marine Mammals and Sea Turtles (including SAR)

Component/Activity	Interaction	Pathway	Ecosystem Linkages
Offshore Construction and Installation, Hook-Up and Commissioning (in Core BdN and Potential Future Development)			
Presence of Vessels	• Sound • Discharges and emissions	**Core BdN and Potential Future Development – PA** • Vessel traffic has potential to cause mortality or injury through collisions. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels. • Some potential for masking of marine mammal communication and foraging due to sound interference. • The discharge of organic wastes may attract marine mammals and sea turtles.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Installation of subsea infrastructure	• Sound Disturbance of the seafloor and benthic habitats and fauna	**Core BdN and Potential Future Development – PA** • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels. • Some potential for displacement or change in benthic habitat use; however, installation activities will occur on the seafloor at depths where most marine mammal and sea turtle species do not occur.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
HUC Activities	• Presence of vessels • Light • Sound • Discharges and emissions	**Core BdN and Potential Future Development – PA** • Vessel traffic has potential to cause mortality or injury through collisons. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels. • The discharge of organic wastes may attract marine mammals and sea turtles.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.

Production and Maintenance Operations (in Core BdN and Potential Future Development)			
Presence of FPSO and Subsea Infrastructure	• Sound	**Core BdN and Potential Future Development – PA** • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of offshore facilities. Some potential for masking of marine mammal communication and foraging.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Waste Management	• Produced water • Other waste discharges	• Ingestion of or contact with produced water may result in sublethal effects due to toxicity. • The discharge of organic wastes may attract marine mammals and sea turtles, but this effect is anticipated to be minimal.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Drilling Activities (in Core BdN and Potential Future Development)			
Presence of Drilling Installation	• Sound	**Core BdN and Potential Future Development – PA** • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of offshore facilities. Some potential for masking of marine mammal communication and foraging due to sound interference.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.

Waste Management	• Discharge of SBM and WBM	**Core BdN and Potential Future Development – PA** With appropriate selection of chemicals (including use of non-toxic drilling fluids), and proper disposal, effects due to disposal of drill muds and cuttings and associated waste materials are considered unlikely.	Benthic habitats provide refuge for small planktonic and benthic invertebrates. Damage to, or mortality of, benthic species could result in loss of refugia and change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Supply and Servicing (in Core BdN and Potential Future Development)			
Marine Vessels	• Vessel traffic • Other waste discharges • Sound emissions	**Core BdN and Potential Future Development – PA** • Vessel traffic has potential to cause mortality or injury through collisions. • Presence of vessels may cause localized, short-term changes in habitat use, including displacement from the immediate area around vessels. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels. • Some potential for masking of marine mammal communication and foraging due to sound interference. • The discharge of organic wastes may attract marine mammals and sea turtles.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Aircraft (helicopters)	• Sound	**Core BdN and Potential Future Development – PA** • At low altitudes (during takeoff and landing), presence of helicopters may result in disruptions from sound or overflight effects. Disruptions may result in temporary loss of useable habitat, increased energy expenditure due to escape reactions and lower food intake due to interrupted foraging or disruption of movements.	Avoidance behaviours of prey species could result in temporary change in food availability and quality for marine and migratory birds and marine mammals and sea turtles during takeoff and landing.

Supporting Surveys (in Core BdN and Potential Future Development)			
Geophysical	• Presence of vessels • Sound	**Core BdN and Potential Future Development – PA** • Vessel traffic has potential to cause mortality or injury through collisions. • Presence of vessels may cause localized, short-term changes in habitat use, including displacement from the immediate area around vessels. • Sounds, such as those from seismic surveys, may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels. • During seismic surveys, permanent auditory injury may occur in the immediate vicinity of the sound source; use of ramp-up procedures and avoidance of seismic sound will reduce the potential for this effect. • Some potential for masking of marine mammal communication and foraging due to sound interference in areas proximate to the sound source.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Env, Geotech, Geo and ROV/AUV	• Vessel traffic • Other waste discharges • Sound emissions	**Core BdN and Potential Future Development – PA** • Vessel traffic has potential to cause mortality or injury through collisions. • Presence of vessels may cause localized, short-term changes in habitat use, including displacement from the immediate area around vessels. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels. • Some potential for masking of marine mammal communication and foraging due to sound interference. • The discharge of organic wastes may attract marine mammals and sea turtles.	Avoidance/attraction behaviours of prey species could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Decommissioning (in Core BdN and Potential Future Development)			
Decommissioning	• Decommissioning of FPSO • Removal of subsea infrastructure • Well decommissioning	**Core BdN and Potential Future Development – PA** • Vessel traffic has potential to cause mortality or injury through collisions. • Presence of vessels may cause localized, short-term changes in habitat use, including displacement from the immediate area around vessels. • Sounds may cause sensory disturbance which may be responsible for the avoidance response in the immediate vicinity of vessels.	Avoidance/attraction behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.

		• Some potential for masking of marine mammal communication and foraging due to sound interference. • The discharge of organic wastes may attract marine mammals and sea turtles. • Marine mammals may temporarily avoid a localized area around the wellhead during mechanical separation of the wellhead from the seabed.	Damage to, or mortality of, benthic plants, fish and invertebrate species could result in loss of refugia and change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.

Table 4: Ecosystem Linkages Special Areas

Component/Activity	Interaction	Pathway	Ecosystem Linkages
Offshore Construction and Installation, Hook-Up and Commissioning (in Core BdN and Potential Future Development)			
Presence of Vessels	• Light • Sound • Discharges and emissions	**Core BdN and Potential Future Development - PA** • No pathway	Avoidance/attraction behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles. There is potential for effects on Commercial Fisheries in Special Areas within the PA if future development occurs.

Installation of subsea infrastructure	• Disturbance of the seafloor and benthic habitats and fauna • Suspended sediments and introduction of sediments of different shapes and sizes	**Core BdN and Potential Future Development – PA** • These activities may result in exposure, injury, burial and/or mortality of benthic organisms if present. • Suspended sediment may clog feeding structures of filter-feeding organisms (e.g. corals, sponges and sea pens)	Benthic habitats provide refuge for small planktonic and benthic invertebrates. Damage to, or mortality of, benthic species could result in loss of refugia and change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
HUC Activities	• Marine discharges	***Core BdN Core BdN and Potential Future Development - PA*** • *No interaction*	
Production and Maintenance Operations (in Core BdN and Potential Future Development)			
Presence of FPSO and Subsea Infrastructure	• Light • Sound	***Core BdN and Potential Future Development – PA*** • *No interaction*	
Waste Management	• Produced water • Other waste discharges • Air emissions	***Core BdN and Potential Future Development – PA*** • *No interaction*	
Drilling Activities (in Core BdN and Potential Future Development)			
Presence of Drilling Installation	• Light • Sound	***Core BdN and Potential Future Development – PA*** • *No interaction*	
Waste Management	• Discharge of SBM and WBM	**Core BdN** • Discharge of SBM and WBM cuttings could result in increased larval mortality and change in feeding behaviour of benthic species up to 200 m from drill site. • Suspended sediment could clog the feeding structures of filter-feeding organisms (e.g. corals, sponges and sea pens)	Benthic habitats provide refuge for small planktonic and benthic invertebrates. Damage to, or mortality of, benthic species could result in loss of refugia and change

		• Deposition of drill cuttings could result in mortality of benthic species through burial, up to 200 m from drill site. **Potential Future Development – PA** • Discharge of SBM and WBM cuttings could result in increased larval mortality and change in feeding behaviour of benthic species. • Suspended sediment could clog the feeding structures of filter-feeding organisms (e.g. corals, sponges and sea pens) • Deposition of drill cuttings could result in mortality of benthic species through burial, up to 1 km from the drill site.	in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Supply and Servicing (in Core BdN and Potential Future Development)			
Marine Vessels	• Vessel traffic • Light emissions • Sound emissions	**Core BdN and Potential Future Development – PA** • Special Areas in the LSA around the Vessel Traffic Route have been identified and/or protected for the presence of marine and migratory birds and to a lesser extent marine mammals and fish and fish habitat, including benthic species. • Artificial light may attract marine and migratory birds resulting in injury or mortality from collisions or stranding on vessels and disorientation that may disrupt foraging or migratory activities. • Sound from marine vessels may disturb marine and migratory birds resulting in temporary disruption of foraging or migratory activities. • Underwater sound from marine vessels may disturb marine mammals and reduce effective communication distance. Based on existing information, marine mammals show various responses to vessels. These include attraction, little or no response or avoidance. • Vessel strikes could result in injury or mortality for marine mammals	Mobile fish species, which are the prey of marine and migratory birds and marine mammals, may show avoidance behaviour in the presence of marine vessels.
Aircraft (helicopters)	• Sound	**Core BdN and Potential Future Development – PA** • Presence of helicopters may result in disruptions to marine and migratory birds. • Marine mammals may show temporary avoidance of noise from helicopters.	Avoidance behaviours could result in temporary change in food availability and quality for marine and migratory birds and marine mammals.

Supporting Surveys (in Core BdN and Potential Future Development)			
Geophysical	• Presence of vessels • Lighting • Sound	**Core BdN and Potential Future Development – PA** • Underwater sound from marine vessels may disturb marine mammals and reduce effective communication distance. Based on existing information, marine mammals show various responses to vessels. These include attraction, little or no response or avoidance. • Seismic surveys such as those planned for this Project, are not expected to cause auditory injury to marine mammals. Some of these mammals may exhibit minor behavioural responses such as avoidance. • Presence of vessels, lighting and sound could result in behavioural changes attraction or avoidance) by mobile fish and invertebrates.	Attraction or avoidance behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Env, Geotech, Geo and ROV/AUV	• Presence of vessels • Lighting • Sound • Contact with seabed	**Core BdN - Potential Future Development – PA** • Contact with seabed may result in exposure, injury, burial and/or mortality of benthic organisms, if present. • Suspended sediment may clog feeding structures of filter-feeding organisms (e.g. corals, sponges and sea pens) • Presence of vessels, lighting and sound could result in behavioural changes (attraction or avoidance) by mobile fish and invertebrates.	Attraction or avoidance behaviours could result in change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles. Damage to, or mortality of, benthic species could result in loss of refugia and change in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.
Decommissioning (in Core BdN and Potential Future Development)			
Decommissioning	• Removal of subsea infrastructure • Well decommissioning	**Core BdN and Potential Future Development – PA** • Removal of subsea infrastructure will result in decline is sessile or low-mobility benthic invertebrates that were supported by the infrastructure	Damage to, or mortality of, benthic species could result in loss of refugia and change

		• Suspended sediment could clog the feeding structures of filter-feeding organisms (e.g. corals, sponges and sea pens)	in food availability and quality for larger marine fish, marine and migratory birds and marine mammals and sea turtles.

Table 5: Ecosystem Linakges Commercial Fisheries and Other Ocean Uses

Component/Activity	Interaction	Pathway	Ecosystem Linkages
Core BdN and Potential Future Development - PA			
All Activities	• Presence of vessels • Anti-collision zones • Subsea infrastructure	• Potential interference with fishing activity (vessels in transit or towing mobile gear, including science surveys) or other vessels along the route. • Potential for project vessel transits to damage fishing gear, particularly fixed fishing gear, which may be left unattended within or near the vessel traffic route. • Potential interference with other ship movements (e.g., freighters, tankers, cruise ships, other oil and gas exploration). • Loss of access to the area by fish harvesters • Potential to indirectly affect commercial fishing activity through changes in fish behavior and avoidance of certain areas.	Abundance, distribution and quality of marine fish in commercial fishing areas.

Table 6: Ecosystem Linkages Indigenous Peoples

Component/Activity	Interaction	Pathway	Ecosystem Linkages
Core BdN and Potential Future Development - PA			
All Activities	• Presence of vessels • Anti-collision zones • Marine discharges • Subsea infrastructure	• Potential for marine-associated fish species known to be used by Indigenous groups for traditional purposes to occur in the Project Area before moving to areas of traditional harvesting. (effects are described in Chapter 9 – Marine Fish and Fish Habitat) • Potential effects of Project activities on Marine and Migratory Birds, including migratory birds potentially harvested for traditional purposes. (effects are described in Chapter 10 – Marine and Migratory Birds) • Potential effects on marine mammals, including those of cultural importance to Indigenous groups (effects are described in Chapter 11 – Marine Mammals and Sea Turtles). • Loss of access to fishing grounds by commercial-communal fishers.	Abundance, availability and quality of marine fish, marine and migratory birds and marine mammals and sea turtles in harvesting areas. Abundance, availability and quality of marine fish in commercial-communal harvesting areas.

APPENDIX C:

INFORMATION TO SUPPORT RESPONSE TO IR-45/ECCC-19;NRCAN-1

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8.0 AIR QUALITY AND GREENHOUSE GASES

To support the regulatory review of the Project, Stantec conducted an air emissions and dispersion modelling study to estimate the Project-related quantities of air contaminants and greenhouse gases (GHGs) released to the atmosphere and to predict associated ground-level concentrations of air contaminants in the vicinity of the Project.

A summary of the findings from this study is presented in this section. Further details pertaining to the development of the air emissions inventory for criteria air contaminants (CACs) and greenhouse gases (GHGs) and dispersion modelling can be found in the Technical Data Report for Air Quality and Greenhouse Gases in Appendix K.

8.1 Overview of Project Emissions

The sources of air contaminants and GHGs during the life of the Project include the following:

- Power and heat production on the floating production, storage and offloading (FPSO)
- Non-routine, unplanned, flaring from the FPSO (i.e. during depressurization of process systems and emergency shut-downs)
- Power production on the drilling installation
- Vessel (support, supply and shuttle tankers) traffic
- Helicopter traffic

The phases of the Project for which air emissions and GHGs were estimated include:

- Construction and installation, and hook-up and commissioning (HUC)
- Concurrent drilling and production
- Normal production operations

These phases were chosen as they represent the timeframe during the Project when air emissions are likely to be greatest, and therefore represents worst-case scenarios for predicting air emissions.

The Core Bay du Nord (BdN) Development Area (refer to Figure 8-1) encompasses the immediate area in which Project activities and components may occur includes the area within which direct physical disturbance to the marine environment may occur. It occupies an offshore area of approximately 470 km^2, encompassing the planned and potential location of the FPSO and supporting infrastructure and activities, including associated anti-collision zones for the FPSO and/or drilling installation(s). The actual footprint of Project facilities within the Core BdN Development Area is approximately 7 km^2. The Project Area (refer to Figure 8-1) includes the Core BdN Development Area and is where Potential Future Development (as described in Section 2.6.7) activities may occur and has an area of approximately 4,900 km^2.

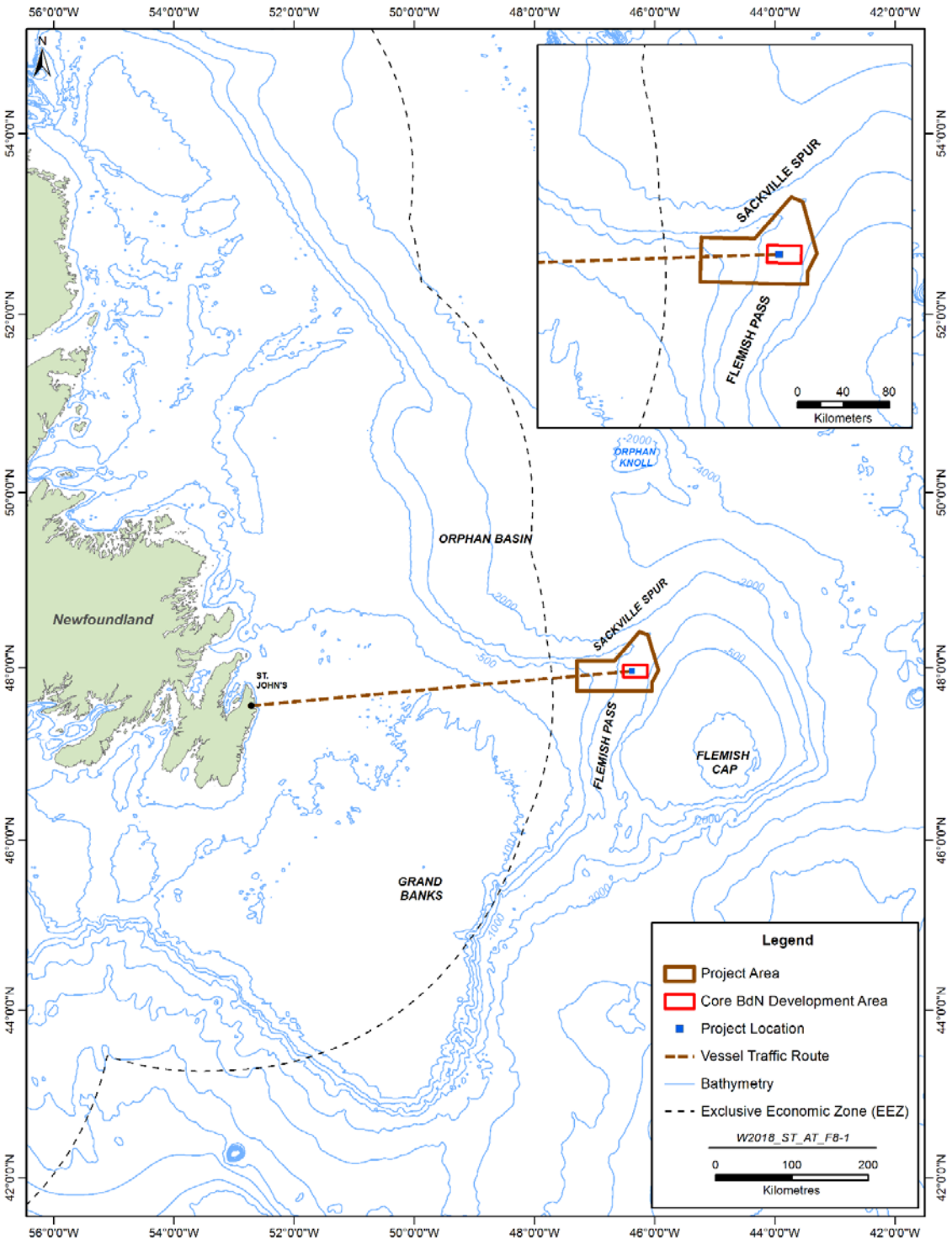

Figure 8-1 Core BdN Development Area

In addition to the above Project phases, air emissions estimates are also provided for specific accidental event scenarios. An overview of potential cumulative interactions of the Project's air emissions in combination with other ongoing or planned activities is also provided.

The following is a description of the assumptions used to estimate overall air emissions.

Hook-up and Commissioning (HUC): The construction and installation, and HUC phase of the Project will occur over approximately five years (2020 to 2025). The HUC portion is expected to release the highest rates (per time unit) of construction related emissions and is anticipated to occur in the latter part of the phase (i.e. 2025) and anticipated to have a duration of approximately four-months. The major sources of air emissions during HUC include power generation at the FPSO, the concurrent operation of the drilling installation, vessel and helicopter traffic, as well as other marine vessels that are used to support the installation (i.e. marine construction). During HUC it is anticipated that the FPSO will be powered by four reciprocating engines (eight engines in total at the FPSO, with four of these on standby), and both the drilling installation and FPSO will be fueled by diesel. During this phase of the Project there will be two support vessels maneuvering within the Core BdN Development Area and one supply vessel making two trips per week between the Core BdN Development Area and eastern Newfoundland and Labrador (NL). Helicopter operation during this phase includes transit, landing and take-off (LTO), approach, and ground idling for up to five trips per week.

Concurrent Drilling and Production, Power Option 1: During the first two to three years of production and maintenance operations, the drilling installation will still be operational within the Core BdN Development Area. The major sources of air emissions during this phase of the Project (2025 to 2027) include the FPSO (both combustion and fugitive emission sources), the drilling installation and vessel and helicopter traffic. For this phase, it is assumed that FPSO will be powered by seven reciprocating engines fueled by produced gas (eight engines in total at the FPSO, with one engine on standby). The drilling installation will be fueled by diesel. Both the FPSO and the drilling are expected to operate year-round. There will be two support vessels maneuvering within the Core BdN Development Area year-round, and supply vessel operation including transit, maneuvering, and offloading for up to two trips per week. The shuttle tanker operation includes transit, maneuvering and loading for 78 trips per year. Helicopter operation during this phase includes LTO, approach, and ground idling for up to 15 trips per week.

Concurrent Drilling and Production, Power Option 2: This phase of the Project would be the same as described above under "Concurrent Drilling and Production, Power Option 1"; however, it involves a second power option for the FPSO which is being considered by the Project. Power Option 2 consists of one gas turbine. All other activities and sources of emissions would be the same as presented above.

Normal Production Operations: The normal operation phase of the Project is expected to occur from 2028 to the end of the life of the Project in 2054. This phase of the Project considers all of the major sources of Project emissions except for the operation of the drilling installation. The FPSO will be fueled by produced gas powered by eight reciprocating engines (seven running, one on standby). There will be one support vessel maneuvering within the Core BdN Development Area and one

supply vessel operating (including transit, maneuvering, and offloading) for up to two trips per week. The shuttle tanker operation includes transit, maneuvering and loading for 78 trips per year and helicopter operation includes LTO, approach, and ground idling for up to five trips per week. Flaring would occur as needed for safety reasons and includes a pilot flare.

Accidental Event 1: One accidental event considered for this Project is the release of air contaminants and GHGs during an emergency non-routine, unplanned, flaring event. For emissions inventory purposes, it is assumed that in one year, up to three full system depressurizations may occur. As this event is non-routine and unplanned, this assumption is likely an overestimate and represents a credible worst-case scenario.

Accidental Event 2: Throughout the production and maintenance phase of the Project there is the potential that produced gas would not be available at the right specification to power the reciprocating engines, and therefore the engines would have to operate on diesel for up to seven days, until the issue is resolved. The scenario assumes continuous operation of 4 power generating engines during this event. All other sources of emissions considered under this operational scenario are the same as those considered under operational Scenario 2, Concurrent Drilling and Production, Power Option 1.

Cumulative Operations: The Project-related releases of air contaminants and GHGs to the atmosphere have the potential to interact and accumulate with the emissions from other sources in the Project Area and beyond.

8.2 Air Emissions Substances of Interest

The air contaminants that are relevant for the Project activities are:

- Nitrogen dioxide (NO_2)
- Sulphur dioxide (SO_2)
- Carbon monoxide (CO)
- Total particulate matter (TPM)
- Particulate matter < 10 microns (PM_{10})
- Particulate matter < 2.5 microns ($PM_{2.5}$)
- Non-methane volatile organic compounds (nmVOC)

The GHGs relevant to the Project are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)

These air contaminants and GHGs were selected for this assessment as these are expected to be released from activities during the different phases of the Project. Although the quantities of non-methane VOCs released to the atmosphere from the Project are expected to be small, estimates of non-methane VOC emissions have been provided due to their potential contribution in the formation

of ozone. It is important to note, that ozone will not be emitted from the offshore construction or operation of the Project, but its formation in the atmosphere is dependent on the availability of NO_2, VOCs, and sunlight.

8.3 Regulatory Criteria and GHG Emission Reduction Targets

8.3.1 Regulatory Criteria

Since the Project is located offshore, there are no air quality regulations that directly apply to the Project. NL is the nearest jurisdiction to the Project. Therefore, the provincial and the federal air quality regulations are applicable to the following overview of air quality.

Ambient air quality in NL is regulated by the *Air Pollution Control Regulations, 2004* (the Regulations) administered under the *Environmental Protection Act* (O.C. 2004-232). The NL Ambient Air Quality Standards (NLAAQS) for several air contaminants are prescribed in Schedule A of the Regulations.

The Canadian Ambient Air Quality Standards (CAAQS) are being developed to reduce emissions and ground-level concentrations of various air contaminants nationally. The CAAQS have been endorsed by the Canadian Council of Ministers of the Environment (CCME) for sulphur dioxide, fine particulate matter ($PM_{2.5}$) and ozone. More recently CAAQS for NO_2 have been endorsed by the CCME. These CAAQS are adopted for the 2020 to 2025 period and are lowered beyond 2025. Predicted Project-related concentrations are compared with the CAAQS adopted for the 2020 to 2025 period.

The CCME has yet to publish a guidance document on the procedures and methodologies that one should follow to determine if measured concentrations of SO_2 or NO_2 exceed the CAAQS. However, it is understood from federal guidance that model predictions (i.e. predicted Project-related concentrations) should not be directly compared to the CAAQS, because these are intended to be compared with measured ambient air quality data and are not considered directly applicable to industrial fence-line concentrations. As such, although the predicted ground-level concentrations of CACs are compared to both the CAAQS and the NLAAQS in Section 8.5, only the NLAAQS would be applicable to the Project.

The provincial and federal ambient air quality standards are presented in Tables 8.1 and 8.2 for the NL *Air Pollution Control Regulations* and the Canadian Ambient Air Quality Standards, respectively.

Table 8.1 Newfoundland and Labrador Ambient Air Quality Standards

Air Contaminant	Time Averaging Period	Ambient Air Quality Standard ($\mu g/m^3$)
NO_2	1-Hour	400
	24-Hour	200
	Annual	100
SO_2	1-Hour	900
	3-Hour	600

Table 8.1 Newfoundland and Labrador Ambient Air Quality Standards

Air Contaminant	Time Averaging Period	Ambient Air Quality Standard (µg/m³)
	24-Hour	300
	Annual	60
CO	1-Hour	35,000
	8-Hour	15,000
TPM	24-Hour	120
	Annual	60[1]
PM_{10}	24-Hour	50
$PM_{2.5}$	24-Hour	25
	Annual	8.8[2]

[1] Geometric Mean
[2] The 3-year average of the annual average concentration
Source: Office of the Legislative Counsel NL (2004)

Table 8.2 Canadian Ambient Air Quality Standards

Air Contaminant	Time Averaging Period	Ambient Air Quality Standard (µg/m³)	
$PM_{2.5}$	24-Hour	27[1] (2020)	
	Annual	8.8[2] (2020)	
NO_2	1-Hour	113[3] (2020)	79[3] (2025)
	Annual	32[4] (2020)	23[4] (2025)
SO_2	1-Hour	183[5] (2020)	170[5] (2025)
	Annual	13[6] (2020)	10[6] (2025)

[1] The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations
[2] The 3-year average of the annual average concentrations.
[3] The 3-year average of the annual 98th percentile of the NO_2 daily-maximum 1-hour average concentrations
[4] The average over a single calendar year of all the 1-hour average NO_2 concentrations
[5] The 3-year average of the annual 99th percentile of the SO_2 daily-maximum 1-hour average concentrations
[6] The average over a single calendar year of all the 1-hour average SO_2 concentrations
Source: CCME (2014a), CCME (2014b), CCME (2014c)

Typically, the results of a Project-related air dispersion modelling study would be added to the existing ambient air quality within the Project Area prior to comparison with ambient air quality standards. However, given the offshore location of the Project where there are no other substantive emission sources nearby, it is likely that background air contaminant concentrations would be very low. Therefore, the background concentrations are assumed to be nominal (zero) for the purposes of this study.

8.3.2 GHG Emission Reduction Targets

Based on information contained in the latest National Inventory Report, produced by Environment and Climate Change Canada (ECCC) (2018) for the 2016 calendar year, the emissions of GHGs from NL are 10,800,000 tonnes carbon dioxide equivalent (CO_2e) and the Canadian GHG emissions for the 2016 calendar year are 704,000,000 tonnes CO_2e.

Beginning on January 1, 2019, the federal government will implement an output-based pricing system (OBPS) for industrial facilities across Canada (Government of Canada 2018) for the provinces of New Brunswick, Ontario, Manitoba, Saskatchewan, Yukon, Nunavut, and Prince Edward Island (Bennett Jones LLP 2018). Other provinces, including NL, have their own systems that have been accepted by ECCC. The NL *Management of Greenhouse Gas Reporting Regulations*, made under the *Management of Greenhouse Gas Act* (Office of the Legislative Counsel 2017), specifies the industrial sectors to which the Regulations apply. In addition to the Regulations, the Government of NL has a proposed carbon pricing plan that would set performance standards (i.e., GHG targets) for large industrial facilities (Government of NL 2018). Currently, offshore oil and gas activities are not subject to the Regulations or the *Management of Greenhouse Gas Act*; however, the proposed carbon pricing plan indicates that amendments are proposed to the Regulations to include offshore oil and gas activities.

In addition to GHG targets for large industrial facilities, the province of NL will also implement a carbon tax on fossil fuels. The carbon tax will start at $20 per tonne of CO_2e and will be adjusted periodically depending on the rates applied to other Atlantic provinces, which, other than Nova Scotia, are subject to the federal carbon tax rate.

On a federal level, GHG emission reduction targets have been set as follows (ECCC 2018):

- A 17 percent reduction below the 2005 emission levels by 2020 (under the 2009 Copenhagen Accord)
- A 30 percent reduction below the 2005 emission levels by 2030 (2015 submission to the United Nations Framework Convention on Climate Change)

8.4 Summary of Mitigation Measures

Mitigation measures that will be implemented to help avoid or reduce the Project-related quantities of air contaminants and GHGs released to the atmosphere include:

- Flaring on the FPSO will not occur during routine operations and excess gas will be reinjected into the reservoir
- Low-pressure (LP) flare gas will be recovered
- High efficiency burners (flare tip) will be used when flaring is required
- Use of variable speed drive equipment with high power consumption (e.g., gas compressors, water injection pumps) to optimize energy efficiency
- Use of waste heat recovery units (WHRUs) for energy optimization, capturing energy from engines / turbine exhaust stack to provide heat for systems on board the FPSO

- Use of high efficiency equipment for power generation
- Air emission sources associated with vessels will adhere to applicable limits set out in Canada's *Vessel Pollution and Dangerous Chemicals Regulations* under the *Canada Shipping Act, 2001*
- Sulphur content in diesel fuel used for the Project will meet the *Sulphur in Diesel Fuel Regulations* and will comply with the sulphur limits in fuels for large marine diesel engines, per the *Vessel Pollution and Dangerous Chemicals Regulations*
- The Project will operate in accordance with the *Canadian Environmental Protection Act*, through the National Ambient Air Quality Objectives for specified CACs, the Ambient Air Quality Standard for fine particulate ($PM_{2.5}$), and International Maritime Organization (IMO) relevant regulations and emission limits under MARPOL

8.5 Project Emissions

As the magnitude and duration of emissions from each of the sources described in Section 8.1 will vary by Project phase, the emissions inventory for CACs and GHGs and the air dispersion modelling for CACs focused on five different operational scenarios. As there is potential for non-routine, unplanned events to occur throughout the life of the Project, two of the operational scenarios included accidental events. Emissions related to cumulative operation with other projects or activities unrelated to the Project are also considered below, qualitatively.

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.

8.5.1 Hook-up and Commissioning

8.5.1.1 Air Quality

For the HUC phase, CAC emissions were estimated for a four-month period and include the operation of the drilling installation, the FPSO, support and supply vessels, helicopters and marine construction. The emissions were estimated using anticipated fuel consumption volumes and fuel-based emission factors (Norwegian Oil and Gas Association 2018) provided by Equinor Canada, which is based on global experience, for the FPSO, drilling installation, support vessels and marine construction, with the exception of particulate matter. The emission factor for total suspended particles (TSP) was acquired from the United States Environmental Protection Agency's (US EPA) AP-42: "Compilation of Air Emission Factors, Chapter 3.4, Large Stationary Diesel and All Stationary Dual-fuel Engines" (US EPA 1996).

As a conservative assumption, it was assumed that the emissions of PM_{10} and $PM_{2.5}$ were equal to that of TSP.

Emissions from the operation of the helicopters were estimated by Stantec using guidance and emission factors published by the Swiss Confederation in the "Guidance on the Determination of

Helicopter Emissions" document (Rindlisbacher and Chabbey 2015). The SO_2 emissions from helicopter LTO were estimated using the estimated fuel used per LTO and the assumed sulphur content of jet fuel (4,000 ppm by mass).

Emissions of nmVOCs from fuel combustion and from fugitive emission sources were estimated by Equinor.

The emission factors used in the estimates are shown in Table 8.3.

Table 8.3 Emission Factors

Source and Fuel	Emission Factor				
	NO_x	CO	SO_2	$PM_{2.5}$	nmVOC
FPSO (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Drilling Installation (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Offshore Support and Supply Vessels (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Marine Construction (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Helicopter (LTO) (jet fuel)	1,066 g/LTO	525 g/LTO	NA	29 g/LTO	-
Note: t/t - tonne of air contaminant per tonne of fuel consumed Source: US EPA (1996), Norwegian Oil and Gas Association (2018), Rindlisbacher and Chabbey (2015)					

The estimated emissions during this phase of the Project (which occurs over a period of 4 months) are presented in Table 8.4.

Table 8.4 Air Contaminant Emissions from Hook-up and Commissioning

Source	Air Contaminant Emission Estimates (tonnes/phase)						
	NO_2	SO_2	CO	TPM	PM_{10}	$PM_{2.5}$	nmVOC
FPSO	297	4.24	29.7	8.14	8.14	8.14	64
Drilling Installation	373	5.34	37.3	10.2	10.2	10.2	27
Offshore Support and Supply Vessels	46.8	0.67	4.68	1.28	1.28	1.28	4
Marine Construction	147	2.10	14.7	4.04	4.04	4.04	10
Helicopter	3.69	2.08	0.45	0.09	0.09	0.09	-
Total	**868**	**14.4**	**86.9**	**23.8**	**23.8**	**23.8**	**105**

Dispersion modelling of air contaminant releases from Project activities, including HUC, was also conducted using the most recent version of the CALPUFF modelling system. As there are no regulatory criteria for total nmVOCs, and as the emissions of nmVOCs were estimated to be small, they were not modelled. For more details pertaining to the dispersion modelling approach and

methodology, refer to the Technical Data Report for Air Quality and Greenhouse Gases in Appendix K.

The predicted ground-level concentrations for CO, NO_2, SO_2, TPM, PM_{10}, and $PM_{2.5}$ during HUC are provided in Table 8.5.

Table 8.5 Predicted Ground-level Concentrations – Hook-up and Commissioning

Substance	Average Period	Maximum Predicted Ground-level Concentrations (µg/m³)	NL Ambient Air Quality Standards (µg/m³)	Canadian Ambient Air Quality Standards (2020) (µg/m³)
CO	1-hour (9th highest)	123	35,000	-
	8-hour (3rd highest)	71.0	15,000	-
NO_2 (OLM)	1-hour (9th highest)	188	400	-
	24-hour (2nd highest)	124	200	-
NO_2 (OLM) (effective January 1, 2020)	Daily max 1-hour (98th percentile) [1]	172	-	113
SO_2	1-hour (9th highest)	18.0	900	183
	3-hour (6th highest)	13.3	600	-
	24-hour (2nd highest)	6.99	300	-
$PM_{2.5}$	24-hour (2nd highest) [2]	15.5	25	27
PM_{10}	24-hour (2nd highest) [2]	15.5	50	-
TSP	24-hour (2nd highest) [2]	15.5	120	-

Notes: Predicted 1-hour, 3-hour and 8-hour average concentrations are based on hourly emission rates
Predicted 24-hour average concentrations are based on daily emission rates
Predicted annual average concentrations are based on annual emission rates
[1] Concentration represents the 3-year average of the annual 98th percentile (8th highest) of the daily maximum 1-hour average concentrations
[2] Includes secondary formation of particulate matter
OLM – Ozone Limiting Method

Based on the modelling results, the predicted ground-level concentrations for HUC are below the respective NLAAQS. The predicted SO_2, $PM_{2.5}$ and annual NO_2 ground-level concentrations are below the CAAQS. However, the hourly predicted NO_2 concentrations are above the CAAQS that are to be implemented in 2020.

Although the predicted concentrations are above the hourly NO_2 CAAQS for HUC, the Project site is in a remote location approximately 500 km off the coast of NL with no sensitive receptors nearby. The maximum predicted concentration (above the CAAQS) generally occur approximately 500 m to 1,700 m from the FPSO and/or drilling installation. Further, the CAAQS are not directly comparable with the model predictions, as the CAAQS are intended to be compared with measured ambient air quality data and not directly applicable to industrial fence-line concentrations

8.5.1.2 GHGs

The CO_2 emissions released during HUC are provided by Equinor Canada and are based on the company's global operations. Produced gas fuel information is based on supplier specification and is used to estimate CH_4 and N_2O emissions from power generation during this phase. N_2O emissions from the offshore support, supply vessels, and helicopters were calculated by Equinor.

The emission factors used in the GHG emissions calculations for HUC are listed in Table 8.6.

Table 8.6 Emission Factors

Source and Fuel	Emission Factor (tonne/tonne)		
	CO_2	CH_4	N_2O
FPSO (diesel)	3.17	NA	0.0002
Drilling Installation (diesel)	3.17	NA	0.0002
Offshore Support and Supply Vessels (diesel)	3.17	NA	0.0002
Marine Construction (diesel)	3.17	NA	0.0002
Source: Norwegian Oil and Gas Association (2018)			

A summary of the estimated GHG emissions during the four-month HUC phase are provided in Table 8.7, and the total GHG emissions are estimated to be 67,819 t CO_2e.

Table 8.7 GHG Emissions from Hook-up and Commissioning

Source	Greenhouse Gas Emissions (t CO_2e/phase)			
	CO_2	CH_4	N_2O	Total
FPSO	40,322	NA	758	41,081
Drilling Installation	16,913	NA	318	17,231
Offshore Support and Supply Vessels / Helicopter	2,667	NA	50	2,717
Marine Construction	6,667	NA	125	6,792
Total	**66,569**	**-**	**1,251**	**67,819**

Note: NA – not applicable

8.5.2 Concurrent Drilling and Production

8.5.2.1 Air Quality

Three operational scenarios were assessed during the production and maintenance operations phase of the Project including:

- Concurrent Drilling and Production, Power Option 1
- Concurrent Drilling and Production, Power Option 2

- Normal Production Operations

For each of the operational scenarios described above emissions were estimated for a one-year period (i.e. the year with the most equipment in operation at the one time) using anticipated fuel consumption volumes and fuel-based emission factors (Norwegian Oil and Gas Association 2018) provided by Equinor Canada for the drilling installation, flare, shuttle tanker and support vessels, with the exception of particulate matter. The emission factor for TSP was acquired from the US EPA AP-42: "Compilation of Air Emission Factors, Chapter 3.4, Large Stationary Diesel and All Stationary Dual-fuel Engines" (US EPA 1996). As a conservative assumption, it was assumed that the emissions of PM_{10} and $PM_{2.5}$ were equal to that of TSP. Emissions of the operations of the FPSO were estimated using anticipated fuel consumption volumes and fuel-based emission factors provided by the potential suppliers for each Power Option – the engine supplier Wartsila for Power Option 1, and the turbine supplier General Electric for Power Option 2. Emissions from the operation of the helicopters were calculated by Stantec using guidance and emission factors published by the Swiss Confederation in the "Guidance on the Determination of Helicopter Emissions" document (Rindlisbacher and Chabbey 2015). The SO_2 emissions from helicopter LTO were estimated using the estimated fuel used per LTO and the assumed sulphur content of jet fuel (4,000 ppm by mass).

Emissions of nmVOCs from fuel combustion were estimated by Equinor using emission factors from the Norwegian Oil and Gas Association (2018). Emissions of nmVOCs from fugitive releases were estimated by Equinor based on the BdN FPSO Concept Study (2017).

Tables 8.8 to 8.10 outline the emission factors used in the estimates for each production and maintenance operations scenario.

Table 8.8 Emission Factors for Concurrent Drilling and Production, Power Option 1

Source and Fuel	Emission Factor				
	NO_x	**CO**	**SO_2**	**PM**	**nmVOC**
FPSO (gas)	10 g/Sm^3	9.3 g/Sm^3	0.0675 g/Sm^3	0.856 g/Sm^3	0.00024 t/kSm^3
Drilling Installation (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Offshore Support and Supply Vessels (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Shuttle Tanker (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Helicopter (jet fuel)	1,066 g/LTO	525 g/LTO	NA	29 g/LTO	-
Flaring (gas)	1.4 g/Sm^3	1.5 g/Sm^3	0.0675 g/Sm^3	0.856 g/Sm^3	0.00006 t/kSm^3

NA – not available. SO_2 emissions were estimated using a mass balance.
Note: t/t - tonne of air contaminant per tonne of fuel consumed
Source: Norwegian Oil and Gas Association (2018), US EPA (1996), Rindlisbacher and Chabbey (2015), Wartsila 14V31DF Specifications.

Table 8.9 Emission Factors for Concurrent Drilling and Production, Power Option 2

Source and fuel	Emission Factor				
	NO_x	CO	SO_2	PM	nmVOC
FPSO (gas)	1.8 g/Sm^3	1.7g/Sm^3	0.0675 g/Sm^3	0.856 g/Sm^3	0.00024 t/kSm^3
Drilling Installation (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Offshore Support and Supply Vessels (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Shuttle Tanker (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Helicopter (jet fuel)	1,066 g/LTO	525 g/LTO	NA	29 g/LTO	-
Flaring (gas)	1.4 g/Sm^3	1.5 g/Sm^3	0.0675 g/Sm^3	0.856 g/Sm^3	0.00006 t/kSm^3

NA – not available. SO_2 emissions were estimated using a mass balance.
Note: t/t - tonne of air contaminant per tonne of fuel consumed
Source: Norwegian Oil and Gas Association (2018), US EPA (1996), Rindlisbacher and Chabbey (2015), General Electric GE LM6000 Specifications.

Table 8.10 Emission Factors for Normal Production Operations

Source and fuel	Emission Factor				
	NO_2	CO	SO_2	PM	nmVOC
FPSO (gas)	10 g/Sm^3	9.3 g/Sm^3	0.0675 g/Sm^3	0.856 g/Sm^3	0.00024 t/kSm^3
Offshore Support and Supply Vessels (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Marine Construction (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Shuttle Tanker (diesel)	0.07 t/t	0.007 t/t	0.001 t/t	0.04 g/MJ	0.005 t/t
Helicopter (jet fuel)	1,066 g/LTO	525 g/LTO	NA	29 g/LTO	-
Flaring (gas)	1.4 g/m^3	1.5 g/m^3	0.0675 g/m^3	0.856 g/m^3	0.00006 t/kSm^3

NA – not applicable. SO_2 emissions were estimated using a mass balance.
Note: t/t - tonne of air contaminant per tonne of fuel consumed
Source: Norwegian Oil and Gas Association (2018), US EPA (1996), Rindlisbacher and Chabbey (2015), Wartsila 14V31DF Specifications.

The estimated emissions from the three scenarios are presented below in Tables 8.11, 8.12, and 8.13, respectively. The emissions presented for concurrent drilling and production are based on data for the years 2025 to 2027 (data varies by source; maximum annual emissions from 2025 to 2027 were carried forward into the inventory) and for normal production the year 2055.

Table 8.11 Air Contaminant Emissions from Concurrent Drilling and Production – Power Option 1

Source	Air Contaminant Emissions (t/yr)						
	NO_2	SO_2	CO	TPM	PM_{10}	$PM_{2.5}$	nmVOC
FPSO (combustion)	643	4.34	598	55.0	55.0	55.0	15
FPSO (fugitive)	NA	NA	NA	NA	NA	NA	15
Drilling Installation	1,120	16.0	112	30.7	30.7	30.7	80
Support and Supply Vessels	140	2.01	14.0	3.85	3.85	3.85	13
Shuttle Tanker	110	1.58	11.0	3.03	3.03	3.03	8
Helicopter	33.2	18.7	4.09	0.85	0.85	0.85	NA
Flaring	6.36	0.31	6.81	3.89	3.89	3.89	0.1
Total	**2,053**	**42.9**	**746**	**97.4**	**97.4**	**97.4**	**130**

Table 8.12 Air Contaminant Emissions from Concurrent Drilling and Production – Power Option 2

Source	Air Contaminant Emission Estimates (t/yr)						
	NO_2	SO_2	CO	TPM	PM_{10}	$PM_{2.5}$	nmVOC
FPSO (combustion)	150	5.64	142	71.5	71.5	71.5	19
FPSO (fugitive)	NA	NA	NA	NA	NA	NA	15
Drilling Installation	1,120	16.0	112	30.7	30.7	30.7	80
Support and Supply Vessels	140	2.01	14.0	3.85	3.85	3.85	13
Shuttle Tanker	110	1.58	11.0	3.03	3.03	3.03	8
Helicopter	33.2	18.7	4.09	0.85	0.85	0.85	NA
Flaring	6.36	0.31	6.81	3.89	3.89	3.89	0.1
Total	**1,561**	**44.3**	**290**	**114**	**114**	**114**	**135**

Table 8.13 Air Contaminant Emissions from Normal Production Operations

Source	Air Contaminant Emissions (t/yr)						
	NO_2	SO_2	CO	TPM	PM_{10}	$PM_{2.5}$	nmVOC
FPSO (combustion)	664	4.48	618	56.9	56.9	56.9	16
FPSO (fugitive)	NA	NA	NA	NA	NA	NA	15
Support and Supply Vessels	140	2.01	14.0	3.85	3.85	3.85	13
Shuttle Tanker	105	1.50	10.5	2.88	2.88	2.88	8
Helicopter	11.1	6.24	1.36	0.28	0.28	0.28	NA

Flaring	2.79	0.13	2.99	1.71	1.71	1.71	0.2
Total	**923**	**14.4**	**647**	**65.6**	**65.6**	**65.6**	**52**

Dispersion modelling of air contaminant releases from Project production and maintenance operations was also conducted using the most recent version of the CALPUFF air dispersion modelling system. Similar to Hook-up and Commissioning, as there are no regulatory criteria for total nmVOCs, and as the emissions of nmVOCs were estimated to be small, they were not modelled. For more information refer to the Technical Data Report for Air Quality and Greenhouse Gases in Appendix K.

The predicted ground-level (i.e. sea-level) concentrations for each operational scenario modelled have been compared to the NLAAQS and CAAQS and the results are presented in Tables 8.14 through 8.16.

Table 8.14 Predicted Ground-level Concentrations – Concurrent Drilling and Production, Power Option 1

Substance	Average Period	Maximum Predicted Ground-level Concentrations (µg/m^3)	NL Ambient Air Quality Standards (µg/m^3)	Canadian Ambient Air Quality Standards (2020) (µg/m^3)
CO	1-hour (9th highest)	250	35,000	-
	8-hour (3rd highest)	136	15,000	-
NO_2 (OLM)	1-hour (9th highest)	143	400	-
	24-hour (2nd highest)	105	200	-
	Annual (1st highest)	9.8	100	-
NO_2 (OLM) (effective January 1, 2020)	Daily max 1-hour (98th percentile) [1]	134	-	113
	Annual (1st highest)	9.8	-	32
SO_2	1-hour (9th highest)	11.6	900	183
	3-hour (6th highest)	8.99	600	-
	24-hour (2nd highest)	3.95	300	-
	Annual (1st highest)	0.21	60	13
$PM_{2.5}$	24-hour (2nd highest) [2]	14.5	25	27
	Annual (3-year average) [2, 3]	0.70	8.8	8.8
PM_{10}	24-hour (2nd highest) [2]	14.5	50	-
TSP	24-hour (2nd highest) [2]	14.5	120	-
	Annual (1st highest) [2, 4]	0.92	60	-

Table 8.14 Predicted Ground-level Concentrations – Concurrent Drilling and Production, Power Option 1

Substance	Average Period	Maximum Predicted Ground-level Concentrations ($\mu g/m^3$)	NL Ambient Air Quality Standards ($\mu g/m^3$)	Canadian Ambient Air Quality Standards (2020) ($\mu g/m^3$)

Notes: Predicted 1-hour, 3-hour and 8-hour average concentrations are based on hourly emission rates
Predicted 24-hour average concentrations are based on daily emission rates
Predicted annual average concentrations are based on annual emission rates
[1] Concentration represents the 3-year average of the annual 98th percentile (8th highest) of the daily maximum 1-hour average concentrations
[2] Includes secondary formation of particulate matter
[3] Concentration represents the 3-year average of the annual average concentrations
[4] Concentration represents the geometric mean annual concentration
OLM – Ozone Limiting Method

Table 8.15 Predicted Ground-level Concentrations – Concurrent Drilling and Production, Power Option 2

Substance	Average Period	Maximum Predicted Ground-level Concentrations ($\mu g/m^3$)	NL Ambient Air Quality Standards ($\mu g/m^3$)	Canadian Ambient Air Quality Standards (2020) ($\mu g/m^3$)
CO	1-hour (9th highest)	60.6	35,000	-
	8-hour (3rd highest)	42.2	15,000	-
NO_2 (OLM)	1-hour (9th highest)	130	400	-
	24-hour (2nd highest)	96.9	200	-
	Annual (1st highest)	9.19	100	-
NO_2 (OLM) (effective January 1, 2020)	Daily max 1-hour (98th percentile) [1]	125	-	113
	Annual (1st highest)	9.19	-	32
SO_2	1-hour (9th highest)	10.6	900	183
	3-hour (6th highest)	8.45	600	-
	24-hour (2nd highest)	3.91	300	-
	Annual (1st highest)	0.21	60	13
$PM_{2.5}$	24-hour (2nd highest) [2]	10.8	25	27
	Annual (3-year average) [2,3]	0.52	8.8	8.8
PM_{10}	24-hour (2nd highest) [2]	10.8	50	-
TSP	24-hour (2nd highest) [2]	10.8	120	-

	Annual (1st highest) [2,4]	0.88	60	-

Notes: Predicted 1-hour, 3-hour and 8-hour average concentrations are based on hourly emission rates
Predicted 24-hour average concentrations are based on daily emission rates
Predicted annual average concentrations are based on annual emission rates
[1] Concentration represents the 3-year average of the annual 98th percentile (8th highest) of the daily maximum 1-hour average concentrations
[2] Includes secondary formation of particulate matter
[3] Concentration represents the 3-year average of the annual average concentrations
[4] Concentration represents the geometric mean annual concentration
OLM – Ozone Limiting Method

Table 8.16 Predicted Ground-level Concentrations – Normal Production Operations

Substance	Average Period	Maximum Predicted Ground-level Concentrations (µg/m^3)	NL Ambient Air Quality Standards (µg/m^3)	Canadian Ambient Air Quality Standards (2020) (µg/m^3)
CO	1-hour (9th highest)	259	35,000	-
	8-hour (3rd highest)	141	15,000	-
NO_2 (OLM)	1-hour (9th highest)	126	400	-
	24-hour (2nd highest)	85.9	200	-
	Annual (1st highest)	6.01	100	-
NO_2 (OLM) (effective January 1, 2020)	Daily max 1-hour (98th percentile) [1]	119	-	113
	Annual (1st highest)	6.01	-	32
SO_2	1-hour (9th highest)	8.78	900	183
	3-hour (6th highest)	6.38	600	-
	24-hour (2nd highest)	2.47	300	-
	Annual (1st highest)	0.06	60	13
$PM_{2.5}$	24-hour (2nd highest) [2]	13.5	25	27
	Annual (3-year average) [2,3]	0.6	8.8	8.8
PM_{10}	24-hour (2nd highest) [2]	13.5	50	-
TSP	24-hour (2nd highest) [2]	13.5	120	-
	Annual (1st highest) [2,4]	0.87	60	-

Notes: Predicted 1-hour, 3-hour and 8-hour average concentrations are based on hourly emission rates
Predicted 24-hour average concentrations are based on daily emission rates
Predicted annual average concentrations are based on annual emission rates
[1] Concentration represents the 3-year average of the annual 98th percentile (8th highest) of the daily maximum 1-hour average concentrations
[2] Includes secondary formation of particulate matter
[3] Concentration represents the 3-year average of the annual average concentrations

[4] Concentration represents the geometric mean annual concentration
OLM – Ozone Limiting Method

Based on the modelling results, the predicted ground-level concentrations for the three production and maintenance operations scenarios are below the respective NLAAQS. The predicted SO_2, $PM_{2.5}$ and annual NO_2 ground-level concentrations are also below the CAAQS. The hourly predicted NO_2 concentrations, however, are above the CAAQS to be implemented in 2020 for the Concurrent Drilling and Production scenarios as well as the Normal Production Operations scenario.

Although the predicted concentrations are above the hourly NO_2 CAAQS for each operational modelling scenario assessed, the Project is in a remote location well offshore (>500 km off the coast of Newfoundland) with no sensitive receptors nearby. The maximum predicted concentration (above the CAAQS) generally occur approximately 500 m to 1,700 m from the FPSO and/or drilling installation. Further, the CAAQS are not directly comparable with the model predictions, as the CAAQS are intended to be compared with measured ambient air quality data and not directly applicable to industrial fence-line concentrations.

The modelling results are provided in more detail in the Technical Data Report for Air Quality and Greenhouse Gases provided in Appendix K.

8.5.2.2 GHGs

Emissions of GHGs during the production and maintenance operations phase of the Project were estimated for the three operational scenarios, as with air quality.

Emissions information for CO_2 for Concurrent Drilling and Production (Power Options 1 and 2) as well as Normal Production Operations were estimated by Equinor Canada based on global operations. Produced gas fuel information is based on supplier specification and is used to estimate CH_4 and N_2O emissions from power generation during this phase. 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 were estimated by Equinor based on the BdN FPSO Concept Study (2017).

The emission factors used in in the GHG emissions calculations for the three operations scenarios were obtained from the Norwegian Oil and Gas Association (2018) and are listed in Table 8.17.

Table 8.17 Emission Factors for Concurrent Drilling and Production – Power Option 1, Power Option 2, and Normal Production Operations

Source and fuel	Emission Factor		
	CO_2	CH_4	N_2O
FPSO (gas), t/kSm^3	2.34	0.00091	0.000019
Drilling Installation (diesel), t/t	3.17	N/A	0.0002
Offshore Support and Supply Vessels (diesel), t/t	3.17	N/A	0.0002

Note: The drilling installation is not included in the Normal Production Operations phase
Source: Norwegian Oil and Gas Association (2018)

A summary of the estimated annual GHGs for Power Option 1, Power Option 2 and Normal Production Operations are provided in Tables 8.18, 8.19, and 8.20. The emissions presented for concurrent drilling and production are based on data for the years 2025 to 2027 (data varies by source; maximum annual emissions from 2025 to 2027 were carried forward into the inventory) and for normal production the year 2055.

Table 8.18 Annual GHG Emissions from Concurrent Drilling and Production, Power Option 1

Source	Greenhouse Gas Emissions (t CO_2e/yr)			
	Combustion			Total CO_2e/yr
	CO_2	CH_4	N_2O	
FPSO (combustion)	142,562	1,386	345	144,293
FPSO (fugitive)	NA	900	NA	900
Drilling Installation	50,738	NA	954	51,692
Offshore Support and Supply Vessels/Helicopter	8,000	NA	150	8,150
Shuttle Tanker	5,000	NA	94	5,094
Flaring	4,277	11	11	4,299
Total	**210,577**	**2,297**	**1,554**	**214,428**

The total annual GHG emissions are estimated to be approximately 214,428 t CO_2e for Concurrent Drilling and Production, Power Option 1. The predicted annual CO_2e emissions for this operational scenario therefore represent approximately 2 percent of NL's average annual emissions, and 0.03 percent of the national average annual emissions.

Table 8.19 Annual GHG Emissions from Concurrent Drilling and Production, Power Option 2

Source	Greenhouse Gas Emissions (t CO_2e/yr)			
	Combustion			Total CO_2e/yr
	CO_2	CH_4	N_2O	
FPSO (combustion)	185,330	1,802	448	187,581
FPSO (fugitive)	NA	900	NA	900
Drilling Installation	50,738	NA	954	51,692

Offshore Support and Supply Vessels/Helicopter	8,000	NA	150	8,150
Shuttle Tanker	5,000	NA	94	5,094
Flaring	4,277	11	11	4,299
Total	**253,345**	**2,713**	**1,657**	**257,715**

The total annual GHG emissions are estimated to be approximately 257,715 t CO_2e for Concurrent Drilling and Production, Power Option 2. The predicted annual CO_2e emissions for this operational scenario therefore represent approximately 2.4 percent of NL's average annual emissions and 0.04 percent of the national average annual emissions.

Table 8.20 Annual GHG Emissions from Normal Production Operations

Source	Greenhouse Gas Emissions (t CO_2e/yr)			
	Combustion			Total CO_2e/yr
	CO_2	CH_4	N_2O	
FPSO (combustion)	155,463	1,511	376	157,351
FPSO (fugitive)	NA	900	NA	900
Offshore Support and Supply Vessels/Helicopter	8,000	NA	150	8,150
Shuttle Tanker	5,000	NA	94	5,094
Flaring	4,664	12	12	4,688
Total	**173,127**	**2,423**	**632**	**176,183**

The total annual GHG emissions are estimated to be approximately 176,183 t CO_2e for Normal Production Operations. The predicted annual CO_2e emissions for this operational scenario therefore represent approximately 1.6 percent of NL's average annual emissions and 0.02 percent of the national average annual emissions.

In summary, the total annual GHG emissions from production and maintenance operations phase of the Project are estimated to range from 176,183 t CO_2e/year to 257,715 t CO_2e/year, depending on the power option chosen for the Project and whether drilling activities overlap with normal production activities.

The EIS Guidelines require that the estimated GHG emissions for the Project be compared to other similar projects. Stantec retrieved reported GHG emissions from three operating offshore production platforms from the federal GHG Reporting Program for the 2016 reporting year (ECCC 2017). The Project normal production emissions and concurrent drilling and production (Option 2) were

compared to those from the three offshore production platforms. The Hebron Platform commenced operations in late 2017 and therefore there is no reporting data for 2016, the latest year that data is available. The comparison is shown in Table 8.21.

Table 8.21 Comparison of Estimated Project GHG Emissions to Operating Production Platforms Offshore NL

Scenario	t CO_2e/year
Terra Nova	560,600
Hibernia	562,463
White Rose	445,861
BdN Project - Predicted Normal Operations	176,183
BdN Project – Concurrent Drilling & Production, Power Option 2	257,715

8.5.3 Accidental Events

8.5.3.1 Air Quality

There is potential for the release of air contaminants to the atmosphere from an accidental event during production and maintenance operations. A full system depressurization and the FPSO running on diesel (in substitute of produced gas) could result in the release of contaminants to the atmosphere.

Therefore, two accidental event scenarios were considered:

- Accidental Event 1 – Full system depressurization over a period of three hours
- Accidental Event 2 – FPSO on diesel for seven days

Air contaminants released from each accidental event were estimated for the event itself and over a one-year period taking into consideration the assumptions regarding credible number of events per year. The emissions were calculated using anticipated fuel consumption volumes and fuel-based emission factors (Norwegian Oil and Gas Association 2018) provided by Equinor Canada for the drilling installation , flare, shuttle tanker and support vessels, with the exception of particulate matter. The emission factor for TSP was acquired from US EPA AP-42: “Compilation of Air Emission Factors, Chapter 3.4, Large Stationary Diesel and All Stationary Dual-fuel Engines” (US EPA 1996).

As a conservative assumption, it was assumed that the emissions of PM_{10} and $PM_{2.5}$ were equal to that of TSP. Emissions of the operations of the FPSO were estimated using anticipated fuel consumption volumes and fuel-based emission factors provided by the engine supplier, Wartsila.

Emissions from the operation of the helicopters were calculated by Stantec using guidance and emission factors published by the Swiss Confederation in the “Guidance on the Determination of Helicopter Emissions” document (Rindlisbacher and Chabbey 2015). SO_2 emissions were from helicopter LTO were estimated using the estimated fuel used per LTO and the assumed sulphur content of jet fuel (4,000 ppm by mass).

Emissions of nmVOCs from fuel combustion were estimated by Equinor using emission factors from the Norwegian Oil and Gas Association (2018).

The estimated emissions during each accidental event scenario considered are presented in Tables 8.22 and 8.23, respectively. The emissions shown in these tables reflect only the source affected by the event.

Table 8.22 Air Contaminant Emissions from Accidental Event 1 (Per Event)

Source	Air Contaminant Emission Estimates (t/event)						
	NO_2	SO_2	CO	TPM	PM_{10}	$PM_{2.5}$	nmVOC
Flaring	0.40	0.02	0.43	0.25	0.25	0.25	0.05

Table 8.23 Air Contaminant Emissions from Accidental Event 2 (Per Event)

Source	Air Contaminant Emission Estimates (t/event)						
	NO_2	SO_2	CO	TPM	PM_{10}	$PM_{2.5}$	nmVOC
FPSO (combustion)	51.9	0.74	5.19	1.42	1.42	1.42	3.8

Annual emissions during a one-year period assuming that up to three accidental events could occur with respect to Accidental Event 1 and two for Accidental Event 2 are shown in Tables 8.24 and 8.25.

Table 8.24 Air Contaminant Emissions from Accidental Event 1 (Annual)

Source	Air Contaminant Emission Estimates (t/yr)						
	NO_2	SO_2	CO	TPM	PM_{10}	$PM_{2.5}$	nmVOC
FPSO (combustion)	643	5.00	591	54.2	54.2	54.2	15
FPSO (fugitive)	NA	NA	NA	NA	NA	NA	15
Drilling Installation	1,120	16.0	112	30.7	30.7	30.7	80
Offshore Supply and Support Vessels	140	2.01	14.0	3.85	3.85	3.85	13
Shuttle Tanker	110	1.58	11.0	3.03	3.03	3.03	8
Helicopter	33.2	18.7	4.08	0.85	0.85	0.85	NA
Flaring	7.57	0.36	8.11	4.63	4.63	4.63	0.2
Total	**2,054**	**43.0**	**747**	**98.1**	**98.1**	**98.1**	**131**

Table 8.25 Air Contaminant Emissions from Accidental Event 2 (Annual)

Source	Air Contaminant Emission Estimates (t/yr)						
	NO_2	SO_2	CO	TPM	PM_{10}	$PM_{2.5}$	nmVOC
FPSO (combustion)	722	5.65	585	55.7	55.7	55.7	14

FPSO (fugitive)	NA	NA	NA	NA	NA	NA	15
Drilling Installation	1,120	16.0	112	30.7	30.7	30.7	80
Offshore Supply and Support Vessels	140	2.01	14.0	3.85	3.85	3.85	13
Shuttle Tanker	110	1.58	11.0	3.03	3.03	3.03	8
Helicopter	33.2	18.7	4.08	0.85	0.85	0.85	NA
Flaring	6.36	0.31	6.81	3.89	3.89	3.89	0.1
Total	**2,132**	**44.3**	**733**	**98.1**	**98.1**	**98.1**	**130**

Dispersion modelling of air contaminant releases from accidental event activities were conducted using the most recent version of the CALPUFF modelling system. As with the construction and operation of the Project, emissions of nmVOCs released from potential accidental events were not modelled. For more details pertaining to the dispersion modelling approach and methodology refer to the Technical Data Report for Air Quality and Greenhouse Gases in Appendix K.

The predicted ground-level concentrations of CO, NO_2, SO_2, during both accidental events are presented in Tables 8.26 and 8.27. Note that TPM, PM_{10} and $PM_{2.5}$ results are not presented for Accidental Event 1 as only those contaminants with averaging periods of less than 24 hours were considered.

Table 8.26 Predicted Ground-level Concentrations – Accidental Event 1 - Flaring

Substance	Average Period	Maximum Predicted Ground-level Concentrations ($\mu g/m^3$)	NL Ambient Air Quality Standards ($\mu g/m^3$)	Canadian Ambient Air Quality Standards (2020) ($\mu g/m^3$)
CO	1-hour (9th highest)	250	35,000	-
NO_2 (OLM)	1-hour (9th highest)	136	400	-
NO_2 (OLM) (effective January 1, 2020)	Daily max 1-hour (98th percentile) [1]	143	-	113
SO_2	1-hour (9th highest)	11.6	900	183
	3-hour (6th highest)	8.99	600	-

Notes: Predicted 1-hour, 3-hour and 8-hour average concentrations are based on hourly emission rates
Predicted 24-hour average concentrations are based on daily emission rates
Predicted annual average concentrations are based on annual emission rates
[1] Concentration represents the 3-year average of the annual 98th percentile (8th highest) of the daily maximum 1-hour average concentrations
OLM – Ozone Limiting Method

Table 8.27 Predicted Ground-level Concentrations – Accidental Event 2 – FPSO on Diesel Seven Days

Substance	Average Period	Maximum Predicted Ground-level Concentrations ($\mu g/m^3$)	NL Ambient Air Quality Standards ($\mu g/m^3$)	Canadian Ambient Air Quality Standards (2020) ($\mu g/m^3$)
CO	1-hour (9th highest)	126	35,000	-
	8-hour (3rd highest)	73.2	15,000	-
NO_2 (OLM)	1-hour (9th highest)	187	400	-
	24-hour (2nd highest)	115	200	-
NO_2 (OLM) (effective January 1, 2020)	Daily max 1-hour (98th percentile) [1]	172	-	113
SO_2	1-hour (9th highest)	20.4	900	183
	3-hour (6th highest)	15.8	600	-
	24-hour (2nd highest)	6.12	300	-
$PM_{2.5}$	24-hour (2nd highest) [2]	13.4	25	27
PM_{10}	24-hour (2nd highest) [2]	13.4	50	-

Notes: Predicted 1-hour, 3-hour and 8-hour average concentrations are based on hourly emission rates
Predicted 24-hour average concentrations are based on daily emission rates
Predicted annual average concentrations are based on annual emission rates
[1] Concentration represents the 3-year average of the annual 98th percentile (8th highest) of the daily maximum 1-hour average concentrations
[2] Includes secondary formation of particulate matter
OLM – Ozone Limiting Method

Based on the modelling results, the predicted ground-level concentrations for the two accidental event scenarios are below the respective NLAAQS. The hourly predicted NO_2 concentrations are above the CAAQS that are to be implemented in 2020. The maximum predicted concentrations (above the CAAQS) generally occur within a small distance (approximately 500 m to 1,700 m) from the anti-collision zone associated with the drilling installation and FPSO installation.

Although the predicted concentrations are above the hourly NO_2 CAAQS, the Project is in a remote location more than 500 km from coastal Newfoundland with no sensitive receptors nearby. The maximum predicted concentration (above the CAAQS) generally occur approximately 500 m to 1,700 m from the FPSO and/or drilling installation. Further, the CAAQS are not directly comparable with the model predictions, as the CAAQS are intended to be compared with measured ambient air quality data and not directly applicable to industrial fence-line concentrations.

The modelling results are provided in more detail in the Technical Data Report for Air Quality and Greenhouse Gases provided in Appendix K.

8.5.3.2 GHGs

Emissions of GHGs during the during the two accidental events were estimated for each event, and annually, as with air quality.

Stantec calculated the CO_2 emissions from the flaring resulting from a depressurization event using flowrate and composition information from Equinor Canada.

The GHG emissions associated with the combustion of diesel for power generation during a seven-day period when produced gas is not available were also calculated by Stantec. Stantec used the estimated produced gas required for operation as provided by Equinor Canada to determine the equivalent diesel volume required, after taking into account the differing heating values of the two fuels.

Emissions of CH_4 from fugitive releases were estimated by Equinor based on the BdN FPSO Concept Study (2017).

A summary of the estimated GHGs released from Accidental Event 1 and Accidental Event 2 are provided in Tables 8.28 and 8.29, respectively.

Table 8.28 Estimated Greenhouse Gas Emissions for Accidental Event 1 (Per Event)

Source	t CO_2e/event			
	CO_2	CH_4	N_2O	Total
Flaring	2,027	5	5	2,037

Table 8.29 Estimated Greenhouse Gas Emissions for Accidental Event 2 (Per Event)

Source	t CO_2e/event			
	CO_2	CH_4	N_2O	Total
PSO - Power Option 1 on diesel fuel	2,352	NA	44	2,396

A summary of the estimated annual GHGs from Project sources during a year with Accidental Event 1 and Accidental Event 2 are provided in Tables 8.30 and 8.31.

Table 8.30 Estimated Greenhouse Gas Emissions for Accidental Event 1 (Annual)

Source	Greenhouse Gas Emissions (t CO_2e/yr)			
	Combustion			Total CO_2e/yr
	CO_2	CH_4	N_2O	
FPSO (combustion)	142,562	1,386	345	144,293
FPSO (fugitive)	NA	900	NA	900
Drilling Installation	50,738	NA	954	51,692

Offshore Support and Supply Vessels/Helicopter	8,000	NA	150	8,150
Shuttle Tanker	5,000	NA	94	5,094
Flaring	10,358	27	26	10,411
Total	**216,658**	**2,313**	**1,569**	**220,539**

The total GHG emissions for one year during which Accidental Event 1 occurs three times are estimated to be approximately 220,539 t CO_2e. Based on information contained in the National Inventory Report, produced by ECCC (2018) for the 2016 calendar year the emissions of GHGs from NL are 10,800,000 tonnes CO_2e and the Canadian GHG emissions for the 2016 calendar year are 704,000,000 tonnes CO_2e. Therefore, the predicted GHG emissions for Accidental Event 1 represent approximately 2 percent of NL's average annual GHG emissions and 0.03 percent of the national average annual GHG emissions.

Table 8.31 Estimated Greenhouse Gas Emissions for Accidental Event 2 (Annual)

Source	Greenhouse Gas Emissions (t CO_2e/yr)			
	Combustion			Total CO_2e/yr
	CO_2	CH_4	N_2O	
FPSO (combustion)	141,798	1,333	332	143,463
FPSO (fugitive)	NA	900	NA	900
Drilling Installation	50,738	NA	954	51,692
Offshore Support and Supply Vessels/Helicopter	8,000	NA	150	8,150
Shuttle Tanker	5,000	NA	94	5,094
Flaring	4,277	11	11	4,299
Total	**209,813**	**2,244**	**1,541**	**213,597**

The total GHG emissions for one year during which Accidental Event 2 occurs twice are estimated to be approximately 213,597 t CO_2e. The predicted annual CO_2e emissions for Accidental Event 2 therefore represent approximately 2 percent of NL's average annual emissions, and 0.03 percent of the national average annual emissions.

Further details pertaining to the development of the GHG emissions inventory can be found in the Technical Data Report for Air Quality and Greenhouse Gases in Appendix K.

8.5.4 Project Contribution to Cumulative Air Emissions

Generally, concentrations of air contaminants in the Project Area without the Project would be low and at background levels. 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) in the area and other exploration activities (e.g., seismic, drilling, and others). 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 this 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 concentration (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 -30 km's 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 NOX) 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.

8.6 Summary

8.6.1 Air Quality

The quantities of criteria air contaminants released to the atmosphere from Project activities were estimated for both construction and operation. The emission inventories were then used to conduct air dispersion modelling to predict the downwind concentrations of air contaminants at ground level (NO_x, SO_2, CO, TSP, PM_{10}, and $PM_{2.5}$).

Emissions of nmVOCs were estimated, and found to be very small, and were therefore not modelled. For example, the estimated nmVOC emissions (combustion and fugitive sources) from the Project ranged from 52 tonnes/year to 132 tonnes/year, with 52 tonnes/year representative of normal operations. The estimated VOC emissions from Newfoundland and Labrador in 2017 were 6,519

tonnes/year (ECCC 2018b). The Project nmVOC emissions from normal operation are therefore a small fraction (0.80 %) of the Newfoundland and Labrador VOC emissions. Based on the low ambient concentrations of NO_2 and VOCs in the Project Area, the relatively low emission rates from the Project, and combined with the infrequent events where there is sufficient warmth from the sun to support the conversion of nmVOCs to ozone, the potential for the generation of ground level ozone is quite small.

The predicted ground level concentrations of the air contaminants of interest to this Project were compared to both the NLAAQS and CAAQS. The predicted ground-level concentrations are below the NLAAQS for each modelled emissions scenario. The predicted SO_2, $PM_{2.5}$ and annual NO_2 ground-level concentrations are below the CAAQS for each modelled scenario. However, the predicted hourly NO_2 concentrations are above the CAAQS to be implemented in 2020 for the six modelled scenarios (HUC, the three production and maintenance operations scenarios, and the two accidental event scenarios). Although predicted concentrations are above the hourly NO_2 CAAQS, the Project is in a remote location approximately 500 km off the coast of Newfoundland. There are no known sensitive receptors nearby. The maximum predicted concentration (above the CAAQS) generally occur at locations approximately 500 m to 1,700 m from the FPSO and/or drilling installation and decrease rapidly with distance for the source. Further, as explained by ECCC, the CAAQS are intended to be used as targets to manage the air quality of the airshed and not to be directly applicable to industrial fence-line concentrations.

8.6.2 GHGs

Annual GHG emissions from the Project were estimated to range from 176,183 t CO_2e/year to 257,715 t CO_2e/year depending on the Project phase. Based on these emissions, the magnitude of the Project's contributions to greenhouse gases would be considered medium. These emissions represent 2.4 percent or less of NL's emissions and 0.04 percent or less (i.e. a small fraction) of the national GHG emissions reported by ECCC for the year 2016 (the latest year for which this report is available).

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APPENDIX D:

INFORMATION TO SUPPORT RESPONSE TO IR-64/DFO-48, DFO-58

Equinor Canada Ltd.
Newfoundland and Labrador Offshore Area
2018 Coral, Sponge and Fish Habitat Survey Plan

EQ-DFO-0059-18

June 2018

TABLE OF CONTENTS

1 Introduction

Equinor Canada Ltd. (formerly Statoil Canada Ltd.) (herein referred to as Equinor Canada) plans to undertake coral, sponge and fish habitat surveys in the Flemish Pass area offshore Newfoundland and Labrador (NL) in 2018. This Coral, Sponge, and Fish Habitat Survey Plan (herein referred to as the Plan) outlines the survey methodology that Equinor Canada (and/or its contractors) will implement during the survey.

The purpose of the survey is to collect baseline data in support of potential exploration and/or development activities in the Flemish Pass area. The data will also be used in support of project design activities. The survey methodology, as described herein, follows the methodology outlined in the *Monitoring of Drilling Activities in Areas with Presence of Cold Water Corals* (NOROG 2013) (herein referred to as the NOROG Guideline), as described in the "Flemish Pass Exploration Drilling Program Environmental Impact Statement" (EIS) (herein referred to as the Exploration Drilling EIS) (Statoil 2017).

As described the NOROG Guideline, side scan sonar (SSS) and multibeam echosounder (MBES) have been effective in mapping coral reefs on the Norwegian Continental Shelf (NCS). However, as indicated by DFO during the regulatory review of the Exploration Drilling EIS, this technology is not likely to detect smaller corals and sponges that are known or likely to be present offshore NL. The intent of this survey is to validate the use of MBES/SSS technology as a tool for coral mapping and to determine the presence of corals and sponges in the survey area. The survey will be conducted with an autonomous underwater vehicle (AUV) equipped with MBES and SSS with a resolution of 0.2 m. By using the higher resolution, it is anticipated that the smaller hard corals may be detected. Anomalies mapped by MBES/SSS will be investigated with a remotely operated vehicle (ROV) equipped with a high definition (HD) camera to capture video and photographs. As for soft corals and sponges, which cannot be detected using acoustic data, visual data will be collected in areas where seabed contact is anticipated. Refer to Section 3 for further details.

The proposed 2018 seabed survey will also include a fish habitat survey to collect data that may be required to support an application for a Fisheries Act Authorization. To ensure a cohesive survey plan, information regarding the fish habitat survey is also included in this document in Section 4. Although these plans are detailed separately, video collected for assessing fish habitat will also be utilized for determining the distribution of corals and sponges.

2 Background

2.1 Anticipated Species Offshore Newfoundland and Labrador

According to DFO, there are approximately 25 to 30 coral species present in waters offshore Atlantic Canada, and are typically found at depths greater than 150 metres (m) (DFO 2017). However, bottom

trawling and video surveys have identified over 50 species of corals and sea pens within, and adjacent to, the Exploration Drilling EIS project area (Statoil 2017).

According to DFO, approximately 34 sponge species have been identified in waters offshore Atlantic Canada and are present throughout a vast range of depths (e.g. inter-tidal zone, depths of 8 kilometres [km]) (DFO 2017). The Exploration Drilling EIS indicated that at least 32 sponge species were observed in, and adjacent to, the project area (Statoil 2017).

As specified in the Exploration Drilling EIS, the following corals and sponges have been observed in the project area (Statoil 2017):

- Black-wire corals
- Large gorgonians
- Small gorgonians
- Soft corals
- Solitary stony corals
- Sea pens
- Numerous sponge species

2.2 Potentials Impacts from Project Activities

Associated with drilling, and potential future development activities in the survey area, potential activities which may affect benthic habitat included the discharge of drill cuttings, and the installation of flowlines, moorings, riser based and other subsea equipment. These activities may result in the depositon of material in excess of defined biological thresholds. As described in the Exploration Drilling EIS, average burial depths of 6.5 millimetres (mm) is the predicted no effect threshold (PNET) for non-toxic sedimentation based on benthic invertebrate species tolerances to burial, however, some species (e.g. *Lophelia pertusa*) may be more susceptible to shallower burial depths, and therefore a conservation PNET of 1.5 mm could also be considered. According to DFO, *Lophelia pertusa* are not known to be present in waters offshore Newfoundland (CEA Agency 2018a, Buhl-Mortensen et al. 2017).

3 Coral and Sponge Survey Details

The 2018 survey may be undertaken in the area, or a portion of the area, shown in Figure 1.

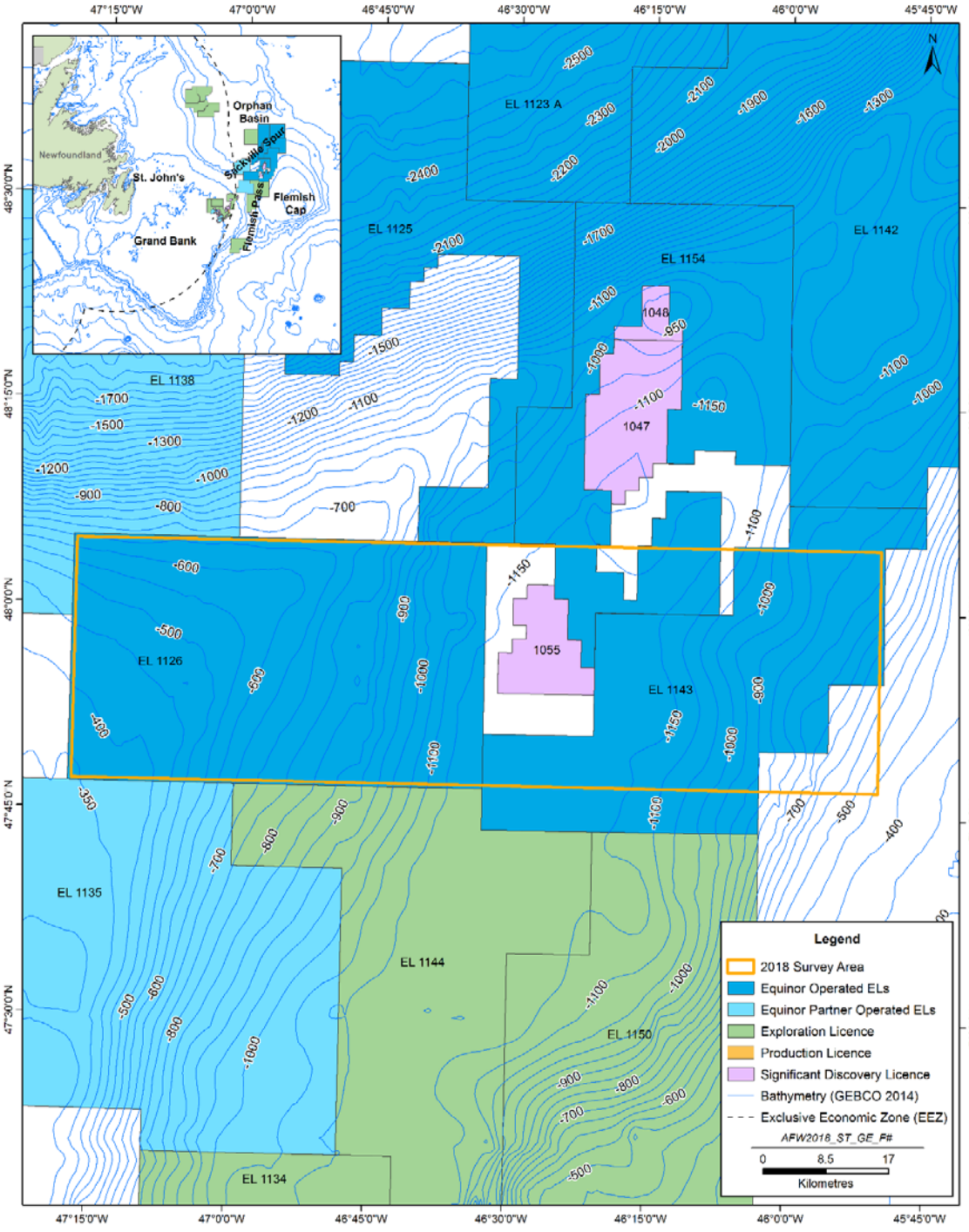

Figure 1. 2018 Survey Area

3.1 Survey Area

Table 1 provides a planned survey area per infrastructure type. In the case of all infrastructure the survey areas outlined in the NOROG Guideline are used as a reference. For drilling locations, including drilling templates, the drill cuttings modelling results from the 2018 Exploration Drilling EIS (Statoil 2018) will be used to determine possible extent of survey coverage areas. The water depth in the proposed seabed survey area ranges from approximately 380 m to 1,200 m. The Exploration Drilling EIS completed drill cuttings dispersion modelling for the 1,110 and 362 m (Statoil 2017); therefore the results provide a useful reference for the 2018 survey area with respect to survey of proposed drill locations.

The proposed coverage areas per infrastructure type is provided in Table 1. The information is a guide only, as biologists on-board, in consultation with the Equinor vessel representative, will decide final areas in the field upon review of the acoustic data.

Table 1. General Survey Plan by Infrastructure Type.

Infrastructure Type	NOROG Guideline	Drill Cuttings Dispersion Modelling	Planned Coverage (minimum)
Drilling Template Locations	500 m radius	100 - 2,000 m	500 m to 1000 m radius
Mooring Locations	50 m radius	n/a	50 m radius
Flowline Corridors	100 m on either side	n/a	100 m on either side of flowline corridor
Other Subsea Infrastructure (pumps, riser base)	100 m radius	n/a	100 m radius

Acoustic data will be collected with MBES and SSS mounted on an AUV. Visual surveys, using high defintition video camera on an ROV, will validate / groundtruth the acoustic information. Additionally, In areas where seabed contact is likely, and where no structures have been identified by acoustic data, the area will be visually inspected with the ROV-camera to determine the presence or absence of corals and sponges in these areas.

Figure 2 provides a preliminary plan for visual surveys with the ROV for each type of infrastructure outlined in Table 1. As data is collected in the field, the proposed survey plans may be modified.

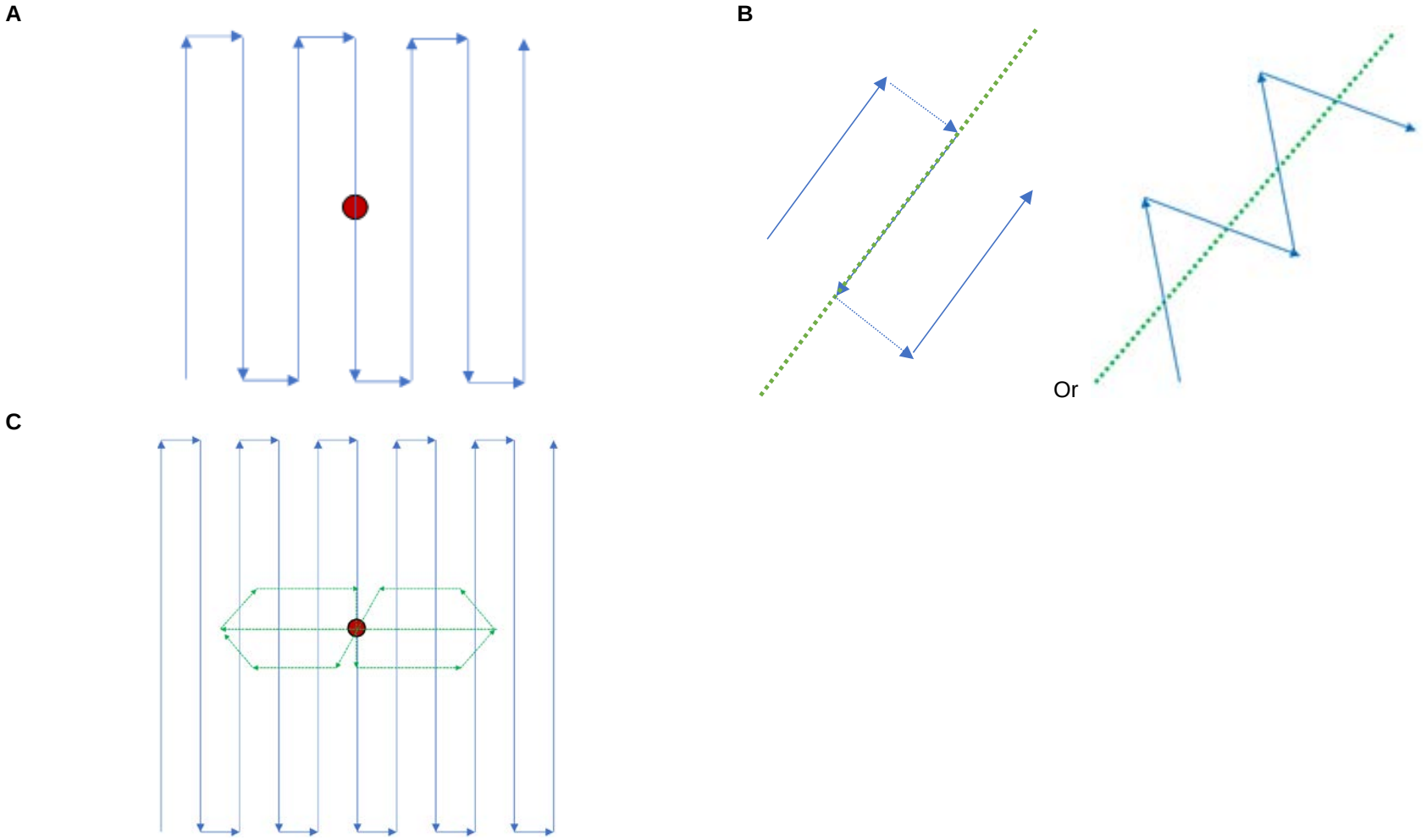

Figure 2. Generalized proposed ROV "S", zig-zag and "butterfly" pattern surveys for A) point infrastructure, B) linear infrastructure, and c) drilling template locations.

3.2 Schedule

The survey is anticipated to start in late summer/early fall 2018 and will take approximately 45 days to complete.

3.3 Survey Team

The survey team on the vessel will consist of the following:

- Geophysical mapping technician
- AUV and ROV technicians and operators
- Marine biologists
- Equinor personnel

3.4 Survey Methodology

For the 2018 survey, the following methodology will be carried out. The following methodology, which is based on the NOROG guideline, may be modified in the field. Biologists on-board and Equinor vessel representatives will decide final areas in the field upon review of the acoustic data as well as optimizing ROV bottom time. As acoustic data and video data are gathered, the methodology may be refined; validation of acoustic data may allow for modifications to the areas selected for ROV video coverage. In addition, video coverage of linear infrastructure (such as flowlines) can be increased by concentrating the effort close to the structure, a longer stretch (linearly) of the actual pipeline/cable route can be surveyed with the same effort.

Equipment for the 2018 survey will include an AUV and inspection class ROV
The AUV is the Fugro EchoSurveyor IV (Appendix 1), which can provide a 0.2 m resolution, and will be equipped with the following:

- MBES bathymetry
- MBES backscatter
- SSS

The Inspection Class ROV will be equipped with the following:

- HD video/stills camera with resolution of 1920x1080 JPEG format for stills and video storage in H264 (MPEG4) format
- Georeferencing capabilities
- Scaling lasers

The AUV will collect acoustic data using MBES and SSS over approximately 144 km^2 within the survey area (Figure 1). Within this survey area, structures elevated at least 0.2 m above the seabed will be

mapped from the acoustic data. In areas where seabed contact is likely, these structures will be investigated with the ROV-camera to determine if the structures are corals. Video data will be collected to provide information on abundance, species type, health, for corals and sponges, if present.

In areas where seabed contact is likely, and where no structures have been identified by acoustic data, the areas will also be inspected with the ROV-camera to identify presence or absence of corals and sponges. Video data will be collected to provide information on abundance, species type, health, for corals and sponges, if present.

The primary factor to determine locations for ROV visual investigations are those locations where seabed infrastructure, including drill locations, is likely to be located. Other factors will also be considered to determine to determine ROV locations, which may include, but not limited to the following:

- Potential coral species locations mapped using acoustic data
- Iceberg plough marks identified by acoustic data
- Areas within, or adjacent to, ecologically and biologically sensitive areas (EBSAs) and/or vulnerable marine ecosystems (VMEs)

3.5 Documentation and Mapping

Two marine biologists will be stationed on the vessel and will be responsible for reviewing ROV footage and documenting the following:

- Species
- Abundance
- Condition (health)
- Size
- Substrate observation
- Other observations (e.g. effects from trawl fishing)

Equinor will use the results of the survey regarding coral and sponge observations to provide baseline data for the area, to assist with planning in drilling locations and subsea infrastructure. The data will also be used to determine appropriate mitigations.

4 Fish Habitat Survey

4.1 Potentials Impacts from Project Activities

The installation of subsea infrastructure, including drilling templates , flowlines, anchors/mooring locations and other subsea infrastructure (riser base) have the potential of affect fish habitat.

4.2 Survey Area

The same survey data will be used for both the fish habitat component and the coral and sponge component. The survey area is based on the predicted areas of interaction for the installation of subsea infrastructure. The following survey coverage is provided as a guide. Modifications to survey locations may be undertaken in the field, as data becomes available.

Table 2. General Survey Plan by Infrastructure Type.

Infrastructure Type	Proposed Survey Type	Coverage	Total Length per unit (m)
Drilling Template Locations	S-Pattern	1000 m x 1000 m	12,000
	Butterfly-pattern[1]	700 m x 200 m	~2,400
Anchors/Mooring Locations	S-Pattern	100 m x 100 m	2,950
Flowline Corridors	S-Pattern	200 m x 750 m [1]	2,450
Other Subsea Infrastructure (pumps, riser base)	S-Pattern	200 m x 200 m	2,400
		Total	**22,200**

[1] Based on most common design used at NCS (R. Stundt, Prin. Eng. SUS Env. Tech., Equinor, pers. comm., 20 June 2018).

It is planned to assess the areas using a “S”, zig-zag or “butterfly” pattern to ensure appropriate coverage of fish habitat with the proposed footprint and area of potential environmental interaction (Figure 2). Linear infrastructure (flowlines) may be surveyed with the AUV-equipped camera or with the ROV HD video camera. If using the ROV, the survey will be will be conducted in an “S” or zig-zag pattern to include the proposed footprint and 100 m corridor on either side of the proposed infrastructure. Approximately 10% of the total length of linear infrastructure will be assessed for fish and fish habitat, surveyed in three separate sections to ensure adequate coverage of habitats in the area. Surveys for any infrastructure within, or adjacent to, ecologically and biologically sensitive areas (EBSAs) and/or vulnerable marine ecosystems (VMEs) may be expanded by 50% to provide additional details on fish and fish habitat.

4.3 Schedule

The survey is anticipated to start in late summer/early fall 2018 and will take approximately 45 days to complete.

4.4 Survey Team

The survey team on the vessel will consist of the following:

- Geophysical mapping technician
- AUV and ROV technicians and operators
- Marine biologists

- Equinor personnel.

4.5 Technical Requirements

The AUV is the Fugro EchoSurveyor IV (Appendix 1), which can provide a 0.2 m resolution, and will be equipped with the following:

- CathX camera;
- Georeferencing capabilities;
- MBES bathymetry;
- MBES backscatter; and
- SSS.

The Inspection Class ROV will be equipped with the following:

- HD video/stills camera with resolution of 1920x1080 JPEG format for stills and video storage in H264 (MPEG4) format;
- Georeferencing capabilities; and
- Scaling lasers.

In areas of proposed infrastructure, either the AUV-equipped camera and/or an ROV camera will be used to assess fish habitat and identify any fish or invertebrates in the area.

4.6 Documentation and Mapping

Two marine biologists will be stationed on the vessel and will be responsible for reviewing AUV imagery and ROV footage and documenting the following:

- Macrofauna species identification and abundance
- Macroflora species identification and abundance
- Substrate observations (Wentworth Scale)
- Other observations (e.g. effects from fishing)
- Discussion on the use and applicability of using acoustic data to identify potential coral targets for offshore NL

5 Additional Information

5.1 Abbreviations

AUV	Autonomous underwater vehicle
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board

DFO	Fisheries and Oceans Canada
EBSA	Ecologically and Biologically Sensitive Area
EPA	Eastern Project Area
EIS	Environmental Impact Statement
HD	High Definition
km	Kilometres
MBES	Multi-Beam Echo Sounder
m	Metres
mm	Millimetres
NCS	Norwegian Continental Shelf
NL	Newfoundland and Labrador
PNET	Predicted No Effect Threshold
ROV	Remotely Operated Vehicle
SBM	Synthetic Based Mud
SPA	Southern Project Area
SSS	Side Scan Sonar
VME	Vulnerable Marine Ecosystem
WBM	Water Based Mud

5.2 Select Definitions

Equinor – Equinor Canada Ltd., and formerly known as Statoil Canada Ltd.

Exploration Drilling EIS – Flemish Pass Exploration Drilling Program Environmental Impact Statement.

NOROG Guideline – Monitoring of Drilling Activities in Areas with Presence of Cold Water Corals.

Plan – Coral and Sponge Survey Plan.

5.3 Changes from Previous Version

N/A – This is the first version of this Plan.

5.4 References

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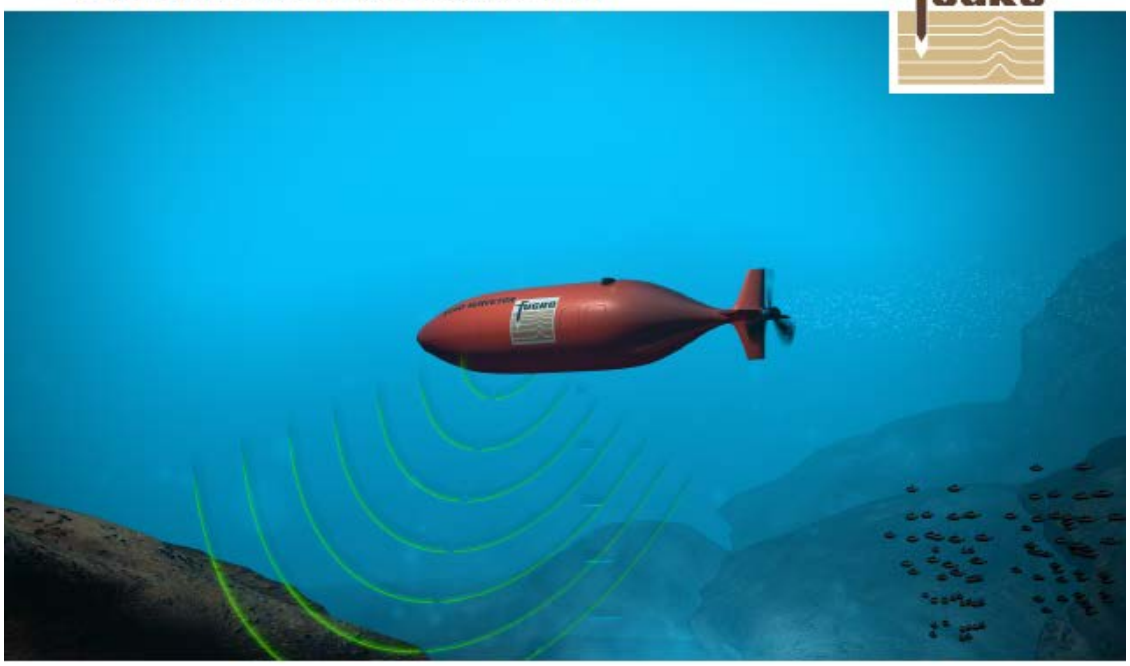
Appendix 1 – Fugro Echo Surveyor VI – Equipment Sheet

EQUIPMENT SHEET OFFSHORE SURVEY



FUGRO
ECHO SURVEYOR VI

Echo Surveyor VI is a "state of the art" Kongsberg Hugin 1000, specifically designed for high resolution and efficient survey operations in water depths down to 3000 metres. AUV's are the ultimate choice of instrument platform for deep sea and remote surveys.

ENGINEERING GRADE HIGH RESOLUTION DATA

Echo Surveyor VI is one of our state of the art Kongsberg Hugin Autonomous Underwater Vehicles (AUV). This particular vehicle is depth rated to 3000m with a payload selected by Fugro to meet the demands of the offshore survey industry.

Fugro's fleet of Kongsberg Hugin AUV's have extensive track records in many deep water and often remote environments around the Globe. Use of such a proven survey platform and experience will provide enhanced productivity, continuity and reliability ensuring optimum adherence to project schedules.

The Hugin 1000 is a modular design and is equipped with enhanced obstacle avoidance radar, Kongsberg EM2040 multibeam echosounder, LED illuminated Digital stills camera to identify seabed features of interest and the option to mobilise one of two sub-bottom profilers to best suit the local geology.

Fugro own and operate six deep water Echo class AUV's which can be mobilised either from one of Fugro's dedicated fleet of international survey vessels or from 3rd party charter ship's.

Hugin 1000 AUV

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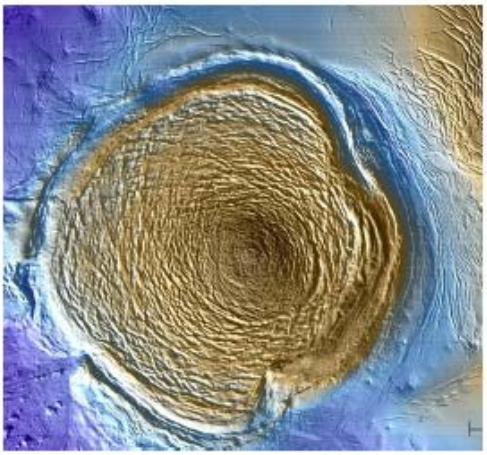
EQUIPMENT SHEET OFFSHORE SURVEY

ECHO SURVEYOR VI

Capabilities

Echo Surveyor VI is installed with the latest lithium polymer battery technology allowing a operational duration of up to 48 hours. With a nominal survey speed of 3.6 knots, large areas can be covered within a single deployment. Our standard payload comprises Multibeam Echosounder, Side Scan Sonar, Sub-Bottom Profiler and LED Digital Stills Camera capable of supporting deep water field developments, site surveys, pipeline and cable routes and regional mapping.

The camera system may be used to assess the characteristics of benthic communities and habitats including deep water coral reefs and chemosynthetic communities. In addition to ascertaining the presence of sensitive species or biotopes. The high resolution stills enable scientists to zoom into the photograph without a significant deterioration in photograph quality and permits identification of specimens to species level



High Resolution Bathymetric Data

Technical Specifications

Physical Data - Hugin 1000	
Length	6.2 m
Weight (air)	1600 kg
Diameter	0.75 m
Depth Rating	3000 m
Survey Speed	2-6 knots (nominal 3.6 knots, maximum 6 knots)
Hull Material	Carbon Fibre Reinforced Syntactic Foam

Physical Data - Launch and Recovery System	
Launch and recovery Container	9.0 m (L), 4.0 m (W), 3.3 m (H), 16080 kg (Weight)
Storage Container 1	6.1 m (L), 2.4 m (W), 2.6 m (H), < 10400 kg (Weight)
Storage Container 2	6.1 m (L), 2.4 m (W), 2.6 m (H), <10400 kg (Weight)

Power System	
Battery	Lithium Polymer
Battery Capacity	458Wh (48 hours approx.)
Propulsion	Smart Motor, Rudders and Propellor

Acoustic Navigation System	
Aided Inertial Navigation System	HIPAP 501 USBL
Inertial Measurement Unit (IMU)	Honeywell HG9900
Depth Pressure Sensor	Paroscientific Digiquartz
Doppler Velocity Log (DVL) + ACDP	RDI Workhorse Navigator WHN - 300

Acoustic Communication	
cNODE Transducer	Kongsberg TD40V, TD30H, TD180
Emergency Link	Kongsberg 25 to 25.6 kHz, 10 bps via HIPAP 501

Surface Communication	
Primary	Radio Link
Secondary	WLAN Link
Emergency	Iridium Data Link

Control Sensors	
CTD	Seiv 208 CTD
Avoidance Sonar	Mesotech 675 kHz
Altimeter Height	Mesotech 675 kHz

Payload Sensors	
Multibeam Echo Sounder	Kongsberg EM2040, 140° Coverage, 200-400 kHz
Sidescan Sonar	Edgetech Full Spectrum,120 & 410 kHz
Sub-bottom Profiler	DW106 (1-10kHz)
Digital Stills Camera	Kongsberg LED illuminated digital stills camera

Fugro N.V.
Veurse Achterweg 10
2264 SG, Leidschendam
The Netherlands
Telephone: +31 (0) 70 311 1422
Email: offshoresurvey@fugro.com
www.fugro.com

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APPENDIX E:

INFORMATION TO SUPPORT RESPONSE TO IR-64/EEEE-19;NREAN-1 AND IR-126/CEAA-56

Table 6.10 Species Observed in the Core BdN Development Area - 2018 Equinor Canada Seabed Survey

Area	Survey Type	Station ID	Common Name	Scientific Name [1]	Sections Present (%)	Contribution to Survey (%)
Southern Area	ROV	P1	Sponges	Porifera (P)	89.7	32.9
			Corals	Anthozoa (C)	89.7	24.6
			Echinoderms	Echinodermata (P)	89.7	18.6
			Jellyfish / anemones	Cnidaria (P)	86.8	16.8
			Other Invertebrate	-	97.1	5.2
			Bivalves / Whelk / Squid	Mollusca (P)	30.9	1.8
		P2	Other Invertebrate	-	83.1	31.7
			Corals	Anthozoa (C)	89.5	30.2
			Sponges	Porifera (P)	87.9	23.6
			Echinoderms	Echinodermata (P)	81.5	6.8
			Jellyfish / anemones	Cnidaria (P)	68.5	6.7
			Bivalves / Whelk / Squid	Mollusca (P)	41.1	1.1
Central Area	ROV	P3	Corals	Anthozoa (C)	94.4	44.6
			Echinoderms	Echinodermata (P)	97.2	22.7
			Sponges	Porifera (P)	66.7	15.4
			Jellyfish / anemones	Cnidaria (P)	94.4	10.7
			Other Invertebrate	-	84.3	6.1
			Bivalves / Whelk / Squid	Mollusca (P)	28.7	0.5
	AUV	P7	Sponges	Porifera (P)	100	34.9
			Corals	Anthozoa (C)	93.8	34.1
			Echinoderms	Echinodermata (P)	100	25.6
			Jellyfish / anemones	Cnidaria (P)	75.0	3.1
			Other Invertebrate	-	37.5	2.1
			Bivalves / Whelk / Squid	Mollusca (P)	18.8	0.2
		P8	Corals	Anthozoa (C)	100	50.8
			Sponges	Porifera (P)	100	30.8
			Echinoderms	Echinodermata (P)	100	10.6

			Other Invertebrate	-	100	5.6
			Jellyfish / anemones	Cnidaria (P)	91.7	2.0
			Bivalves / Whelk / Squid	Mollusca (P)	33.3	0.2
		P9	Sponges	Porifera (P)	100	39.0
			Corals	Anthozoa (C)	100	34.9
			Echinoderms	Echinodermata (P)	94.1	18.7
			Jellyfish / anemones	Cnidaria (P)	100	4.5
Central Area	AUV	P9	Other Invertebrate	-	64.7	2.6
			Bivalves / Whelk / Squid	Mollusca (P)	17.6	0.1
		P10	Sponges	Porifera (P)	93.5	51.5
			Corals	Anthozoa (C)	100	21.8
			Jellyfish / anemones	Cnidaria (P)	100	13.7
			Echinoderms	Echinodermata (P)	100	10.3
			Other Invertebrate	-	93.5	2.1
			Bivalves / Whelk / Squid	Mollusca (P)	61.3	0.5
Eastern Area	ROV	P4a	Corals	Anthozoa (C)	86.4	40.8
			Jellyfish / anemones	Cnidaria (P)	80.5	30.0
			Sponges	Porifera (P)	22.0	16.1
			Echinoderms	Echinodermata (P)	74.6	9.8
			Bivalves / Whelk / Squid	Mollusca (P)	48.3	2.1
			Other Invertebrate	-	21.2	1.2
		P4b	Corals	Anthozoa (C)	100	51.2
			Jellyfish / anemones	Cnidaria (P)	100	28.9
			Other Invertebrate	-	81.3	12.8
			Echinoderms	Echinodermata (P)	100	6.9
			Bivalves / Whelk / Squid	Mollusca (P)	12.5	0.2
			Sponges	Porifera (P)	6.3	0.1
Eastern Area	AUV	P4b	Corals	Anthozoa (C)	100	62.2
			Jellyfish / anemones	Cnidaria (P)	96.3	17.9
			Echinoderms	Echinodermata (P)	98.8	11.9
			Other Invertebrate	-	91.5	6.3

			Bivalves / Whelk / Squid	Mollusca (P)	47.6	1.6
			Sponges	Porifera (P)	6.1	0.1
		P4c	Jellyfish / anemones	Cnidaria (P)	100	47.7
			Corals	Anthozoa (C)	100	34.3
			Echinoderms	Echinodermata (P)	98.0	10.4
			Other Invertebrate	-	93.4	5.7
			Bivalves / Whelk / Squid	Mollusca (P)	42.8	1.1
			Sponges	Porifera (P)	21.7	0.8

[1]Taxonomic group: P – Phylum, C – Class
Contribution to survey: Reported percentage of total abundance, biomass, or trawl presence in the survey.
Other Invertebrates includes minor groups with low abundances (arthropods, annelids, brachiopods, and ctenophores)

6.11 Summary of Coral Groups from 2018 Equinor Canada Seabed Survey

Area	Survey Type	Station ID	Functional Group	Scientific Name [1]	Sections Present (%)	Contribution to Coral (%)
Southern Area	ROV	P1	Soft coral	Alcyonacea (O)	89.7	74.8
			Sea pens	Pennatulacea (O)	86.8	24.5
			Branching coral	Alcyonacea (O)	11.8	0.7
		P2	Soft coral	Alcyonacea (O)	89.5	95.1
			Sea pens	Pennatulacea (O)	50.0	4.1
			Branching coral	Alcyonacea (O)	16.9	0.7
			Black coral	Antipatharia (O)	0.8	0.1
			Hard coral	Scleractinia (O)	1.6	0.1
Central Area	ROV	P3	Soft coral	Alcyonacea (O)	93.5	92.7
			Sea pens	Pennatulacea (O)	79.6	6.1
			Branching coral	Alcyonacea (O)	30.6	1.1
			Black coral	Antipatharia (O)	0.9	0.1
	AUV	P7	Soft coral	Alcyonacea (O)	93.4	92.6
			Sea pens	Pennatulacea (O)	62.5	5.9
			Branching coral	Alcyonacea (O)	31.3	1.1
			Hard coral	Scleractinia (O)	18.8	0.4

		P8	Soft coral	Alcyonacea (O)	100	99.3
			Sea pens	Pennatulacea (O)	33.3	0.4
			Branching coral	Alcyonacea (O)	25.0	0.3
		P9	Soft coral	Alcyonacea (O)	100	95.6
			Sea pens	Pennatulacea (O)	94.1	4.0
			Branching coral	Alcyonacea (O)	11.8	0.2
			Hard coral	Scleractinia (O)	5.9	0.1
		P10	Soft coral	Alcyonacea (O)	93.5	63.0
			Sea pens	Pennatulacea (O)	93.5	21.8
			Branching coral	Alcyonacea (O)	48.4	2.2
			Hard coral	Scleractinia (O)	12.9	0.3
			Black coral	Antipatharia (O)	3.2	0.1
Eastern Area	ROV	P4a	Sea pens	Pennatulacea (O)	86.4	76.0
			Soft coral	Alcyonacea (O)	17.8	21.6
			Branching coral	Alcyonacea (O)	26.3	2.4
		P4b	Sea pens	Pennatulacea (O)	100	96.7
			Branching coral	Alcyonacea (O)	56.3	3.1
			Hard coral	Scleractinia (O)	6.3	0.2
	AUV	P4b	Sea pens	Pennatulacea (O)	100	96.4
			Branching coral	Alcyonacea (O)	58.5	3.5
			Hard coral	Scleractinia (O)	3.7	0.1
		P4c	Sea pens	Pennatulacea (O)	100	87.5
			Soft coral	Alcyonacea (O)	36.8	6.7
			Branching coral	Alcyonacea (O)	67.1	5.4
			Hard coral	Scleractinia (O)	6.6	0.3
			Black coral	Antipatharia (O)	2.6	0.1

[1]Taxonomic group: O – Order, SO – Superorder, F - Family
Contribution to survey: Reported percentage of total abundance, biomass, or presence in the survey.
Functional Groups are based on Kenchington et al. (2015)

Table 6-60 Canadian Ecologically and Biologically Significant Areas in the RSA

EBSA	Rationale for Identification/Designation	Distance to Special Area (km)		
		CBdN	PA	LSA
Northeast Slope	High aggregations of Greenland halibut and spotted wolffish, which congregate in spring. Concentrations of cetaceans, pinnipeds and corals. Area: 19,731 km²	89	31	Intersect (PA/TR)
Virgin Rocks	High aggregations of capelin and other spawning groundfish such as Atlantic cod, American plaice and yellowtail flounder. Seabird feeding areas. Unique geological features and habitat. Area 7,294 km²	308	247	80
Lilly Canyon-Carson Canyon	Concentration, reproduction and feeding area for Iceland scallop. Aggregation and refuge/overwintering for cetaceans and pinnipeds. Area: 2,180 km²	300	257	207
Southeast Shoal	Highest benthic biomass in the Grand Banks; aggregation, feeding, breeding and/or nursery habitats for capelin, yellowtail, cetaceans, seabirds, American plaice and Atlantic cod. Reproduction of striped wolffish. Unique populations of species. Unique sandy habitat with important glacial history. Area: 15,402 km²	435	386	310
Southwest Slope	Critical to a wide variety of seabirds, providing the highest density of pelagic seabird feeding within the PBGB-LOMA. Many marine mammals and leatherback sea turtles aggregate in summer. Area: 25,181 km²	610	552	273
St. Mary's Bay	***Significant colonies and foraging area for common murre, northern gannet, razorbill and black-legged kittiwake. Aggregations of harlequin duck (species of Special Concern under SARA), salmon, capelin, common eider, Mysticetes functional group, hooded seal, leatherback turtle.*** ~~Description not available.~~ Area: 3,989 km²	527	468	63
Haddock Channel Sponges	***Largest sponge SBA on the shelf in the study area. Important aggregations of capelin and American plaice.*** ~~Description not available.~~ Area: 490 km²	600	539	189
Eastern Avalon	Seabird feeding areas. Cetaceans, leatherback turtles and seals feed in the area from spring to fall. Area: 5,948 km²	418	358	Intersect (TR)
Baccalieu Island	***Noted aggregations of killer whales, capelin, shrimp, plankpiscivores, spotted wolfish and seabird functional***	409	351	Intersect (TR)

	groups. Capelin spawning area. Important foraging area for Atlantic puffin, black-legged kittiwake and razorbill. Intersects an IBA and a Provincial Seabird Ecological Reserve. ~~Description not available.~~ Area: 6,922 km²			
Bonavista Bay	***Significant aggregations of eelgrass, salmon, killer whale, harbour seal, Mysticetes and duck functional groups. Important area for capelin and sea lamprey spawning. Significant foraging area for black-legged kittiwake and tern species.*** ~~Description not available.~~ Area: 3,141 km²	508	450	103
Fogo Shelf	Funk Island, the largest common murre colony in the western North Atlantic and the only northern gannet breeding colony in the NL Shelves Bioregion. Other bird species aggregations. Abundance of beach and sub-tidal capelin spawning areas. Important cetacean feeding areas. Several areas of marine mammals' presence. Area: 9,403 km²	50***2***~~1~~	445	175
Notre Dame Channel	Recognized for cetacean feeding and migration. Frequented by several species of seabirds. Harp seals feed in the area during winter. Area: 6,222 km²	47***9***~~7~~	424	21***6***~~5~~
Orphan Spur	High concentrations of corals. Densities of sharks and species of conservation concern (e.g., northern, spotted and striped wolffish, skates, roundnose grenadier, American plaice, redfish). Area: 21,569 km²	26***4***~~3~~	214	147
Labrador Slope	High diversity of corals, sponges, rare or Endangered species, core species and fish functional groups. Rare or Endangered species: Atlantic, spotted and northern wolffish. Significant concentrations of roundnose grenadier, skates, northern shrimp, Greenland halibut, redfish, Atlantic cod and American plaice.	61***4***~~2~~	579	5***20***~~19~~
Southern Pack Ice	Seasonal pack ice recognized for its importance to marine mammals and seabirds.	Not applicable		
Source: Templeman (2007); DFO (2013, 2016e, ***2019***); Amec (2014a); N Wells (pers comm 2018)				

APPENDIX F:

INFORMATION TO SUPPORT RESPONSE TO IR-101/CONFORMITY DFO-3

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

Project Component / Activity	Potential Environmental Effects				Associated Mitigations
	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)	
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	●	●	●	●	D, E, F, G,
Installation of Subsea Infrastructure (including potential protection)	●	●	●	●	A, C
Hook-up and Commissioning					
Presence of Vessels					
▪ Lighting		●		●	
▪ Sound	●	●		●	
▪ Discharges and Air Emissions	●	●	●	●	D, E, F, G
HUC Activities					
▪ Marine Discharges		●		●	E, F
PRODUCTION AND MAINTENANCE OPERATIONS					
Presence of FPSO and Subsea Infrastructure					
▪ Lighting		●		●	
▪ Sound	●	●		●	
Waste Management - Marine Discharges and Emissions					

▪ Produced Water	●	●	●	●	E, F
▪ Other Waste Discharges		●		●	D, E, F, G
▪ Air Emissions (including flaring)					
DRILLING ACTIVITIES					
Presence of Drilling Installation					
▪ Lighting		●		●	
▪ Sound	●	●		●	
Waste Management - Marine Discharges and Emissions					
▪ Drill Cuttings	●	●	●	●	B, E, F
▪ Other Waste Discharges		●		●	D, E, F, G
▪ Air Emissions (including flaring)					
SUPPLY AND SERVICING					
Marine Vessels					
▪ Presence	●	●		●	D, E, F, G
▪ Lighting		●		●	
▪ Sound	●	●		●	
Aircraft (helicopters)					
▪ Sound					
SUPPORTING SURVEYS					
Geophysical Activities					
▪ Presence of Vessels and Towed Equipment	●	●		●	D, E, F, G
▪ Lighting		●		●	
▪ Sound	●	●	●	●	H
Environmental, Geotechnical, Geological, and ROV / AUV Surveys					
▪ Presence of Vessels	●	●		●	D, E, F, G
▪ Lighting		●		●	
▪ Sound		●		●	
▪ Contact with Seabed	●	●	●	●	
DECOMMISSIONING					

Decommissioning of FPSO	●	●		●	D, E, F, G, I
Decommissioning of Subsea infrastructure	●	●		●	E, F, I
Well Decommissioning	●	●		●	E, I, J
POTENTIAL FUTURE DEVELOPMENT					
Offshore Construction and Installation, and HUC	●	●	●	●	A, C, D, E, F, G,
Production and Maintenance Operations	●	●	●	●	D, E, F, G,
Drilling Activities	●	●	●	●	B, D, E, F, G
Supply and Servicing	●	●	●		D, E, F, G
Supporting Surveys	●	●	●	●	D, E, F, G, H
Decommissioning	●	●	●	●	D, E, F, G, I, J, K

APPENDIX G:

INFORMATION TO SUPPORT RESPONSE TO IR-149/DFO-144B

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12.0 SPECIAL AREAS: ENVIRONMENTAL EFFECTS ASSESSMENT

Special areas in offshore Newfoundland and Labrador (NL) have been identified based on their defining environmental features, including the presence of sensitive habitats and species such as Marine Fish and Fish Habitat, Marine and Migratory Birds and Marine Mammals and Sea Turtles and their human use and societal value. The effects of the Project from routine operations on the associated Valued Components (VCs) (i.e., Marine Fish and Fish Habitat, Marine and Migratory Birds, Marine Mammals and Sea Turtles) are discussed in Chapters 9 to 11, respectively, and this information is foundational to this Chapter. Various types of special areas in marine and coastal environments have been identified and / or protected based on socioeconomic interests such as economic or recreational / cultural activities. These include protective measures to reduce the effects of bottom-trawl fishing, which supports long-term sustainability of commercial fisheries, meaning that these special areas are not currently used for fishing. Effects on Commercial Fisheries and Other Ocean Uses are addressed in more detail in Chapter 13.

This Chapter provides an assessment of potential effects of the Project on the Special Areas VC based on the defining features for which special areas have been identified and / or protected. While there are a number of special areas in the Project Regional Study Area (RSA) (additional information can be found in Section 6.4), the focus of the effects assessment is on those special areas that are within the Local Study Area (LSA), including the vessel traffic route.

12.1 Environmental Assessment Study Areas and Effects Evaluation Criteria

The following sections define the spatial and temporal context within which potential environmental effects on Special Areas are assessed and provide the definition of a significant residual adverse environmental effect. These have been established to direct and focus the environmental effects assessment for the VC.

12.1.1 Spatial Boundaries

Four spatial assessment boundaries have been defined for the environmental effects assessment of this VC. They reflect the Core Bay du Nord (BdN) Development, the Potential Future Development, and the varying ways in which the Project and VC may interact. The boundaries are informed by the nature, scale, timing, and other characteristics of the Project and the existing environmental setting, and potential environmental interactions. These Study Areas are defined as follows and are shown in Figure 12-1.

Core BdN Development Area: The Core BdN Development Area encompasses the immediate area in which Project activities and components may occur and includes the area within which direct disturbance to the marine environment may occur. It occupies an offshore area of approximately 470 km^2, encompassing the planned location of the floating production, storage and offloading (FPSO) and supporting subsea infrastructure and activities. The actual seabed footprint of Project facilities within the Core BdN Development Area is approximately 7 km^2.

Project Area: The broader Project Area is where Potential Future Development (as described in Section 2.6.6) may occur. While the Project Area is defined as an overall area that encompasses such activities for the duration of the Project, different components and activities may occupy smaller areas within this overall area, as described in Chapter 2. The Core BdN Development Area is located entirely within the Project Area. The Project Area is approximately 4,900 km^2.

Local Study Area (LSA): The LSA encompasses the overall geographic area over which all planned and routine Project-related environmental interactions may occur. It represents the predicted environmental zone of influence of the Project's planned components and activities, within which Project-related environmental changes to Special Areas may occur and can be assessed and evaluated. The LSA is conservatively defined as a 50 km wide area around the offshore Project Area and 16 km around the associated vessel traffic route to encompass the zones of influence for the three preceding biological VCs (i.e. Marine Fish and Fish Habitat, Marine and Migratory Birds and Marine Mammals and Sea Turtles).

Regional Study Area (RSA): The environmental effects assessment also recognizes and considers the characteristics, distributions, and movements associated with the individual VCs under consideration from an ecological perspective. The RSA is the area within which Project-related environmental effects may overlap or accumulate with the environmental effects of other projects or activities that have been or will be carried out (i.e., cumulative effects). The RSA also encompasses the predicted zone of influence of a potential oil spill event, as summarized in Section 16.4, specifically, the area of maximum cumulative surface oil thickness for the 95th percentile surface oil exposure case at the ecological threshold of 10 g/m^2 (0.01 mm). The RSA captures the marine waters offshore eastern NL, including all or part of Northwest Atlantic Fisheries Organization (NAFO) Divisions 2J, 3K, 3L, 3M, 3N and 3O.

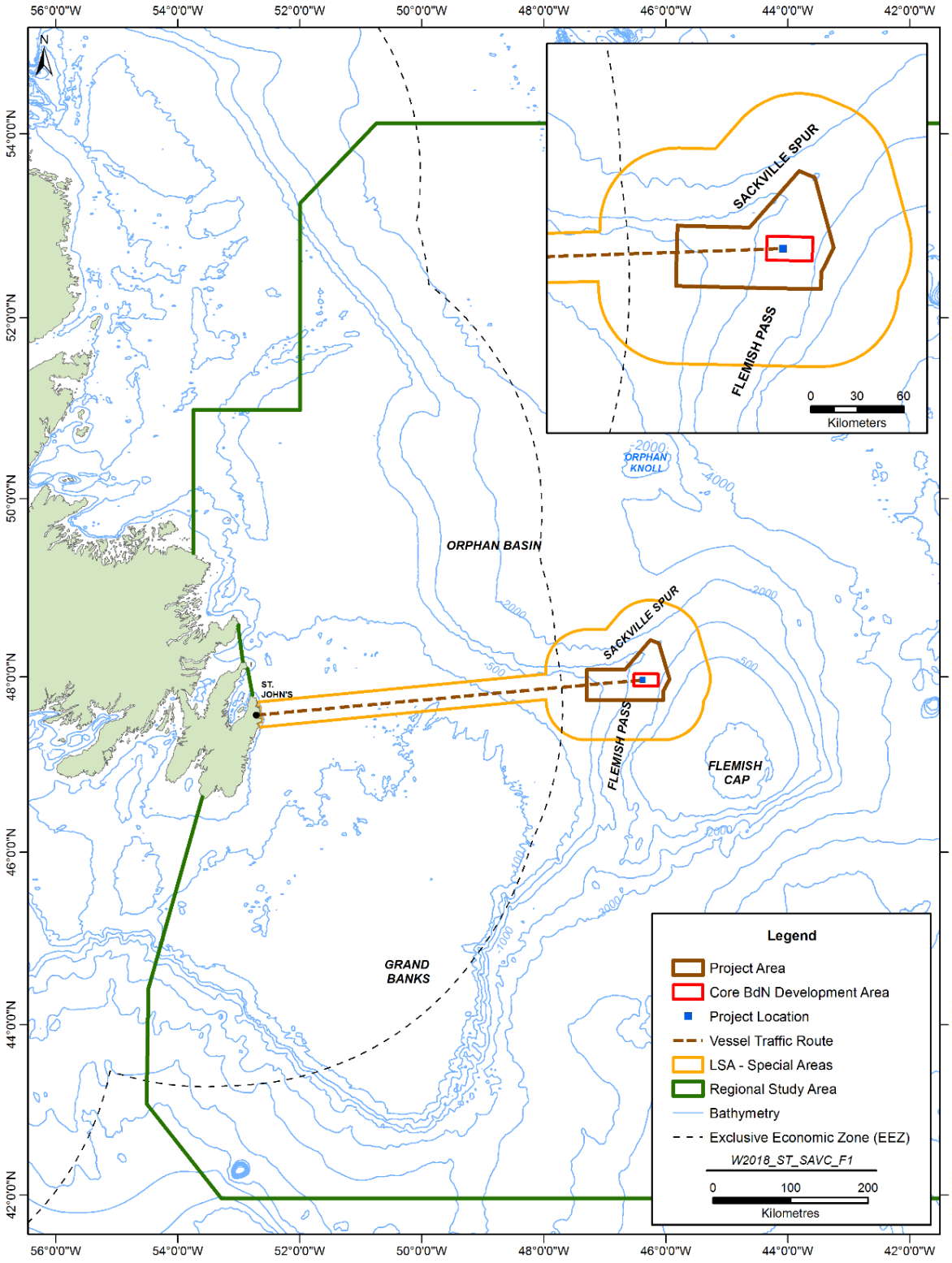

Figure 12-1 Environmental Assessment Study Areas: Special Areas

12.1.2 Temporal Boundaries

The temporal boundaries for the effects assessment encompass the frequency and duration of routine Project-related activities as well as the likely timing of resulting environmental effects. The overall schedule for the Project is provided in Section 2.1.1, and the temporal boundaries of each Project phase are provided in Table 12.1.

Table 12.1 Temporal Boundaries by Project Phase

Project Phase	Temporal Extent of Phase
Core BdN Development Phases	
Offshore Construction and, Installation, and Hook-up and Commissioning (HUC)	• Site surveys as early as 2020 • Offshore construction as early as 2023 • Approximately 5 years; 2020 to 2025; seasonal to year-round • Offshore HUC – likely to be carried out over a four-month timeframe; any time of year
Production and Maintenance Operations	• Commencement anticipated in 2025 • 12 to 20 years; year-round
Drilling Activities	• Commencing as early as 2023, but may occur earlier • Approximately 3 to 5 years; year-round
Supply and Servicing	• Commencing as early as 2020 • Ongoing throughout life of Project; year-round
Supporting Surveys	• Commencing as early as 2020 • Ongoing throughout life of Project • Short-term (e.g., weeks to months)
Decommissioning	• Commencing at end of Project life (either at end of Core BdN Development or Potential Future Development) • Approximately 2 to 4 years; year-round
Potential Future Development	*Extension of Project life to a maximum of 30 years*
Offshore Construction and Installation, and HUC	• As required, depending on need for tie-backs • Likely seasonal activity but some activities could occur year-round
Production and Maintenance Operations	• Extension of Project life to 30 years • Year-round
Drilling Activities	• Total timeframe for drilling depends on number of wells required; may require drilling up to additional 20 development wells • Year-round
Supply and Servicing	• Extension of Project life to 30 years • Year-round
Supporting Surveys	• Ongoing throughout extended life of Project • Short-term (e.g., weeks to months)

Table 12.1 Temporal Boundaries by Project Phase

Project Phase	Temporal Extent of Phase
Decommissioning	• Commencing at end of Project life (either at end of Core BdN Development or Potential Future Development) • Approximately 2 to 4 years; year-round

12.1.3 Environmental Effect Significance Definitions

Significant residual adverse environmental effects are considered to be those that could cause a change in a VC that would alter its status or integrity beyond an acceptable and sustainable level. For the purposes of this Project, a significant residual adverse environmental effect on Special Areas is defined as one that would cause:

- A detectable adverse change in one or more of the important and defining ecological and sociocultural characteristics of such an area, resulting in a decrease in its overall integrity, value and use.

The potential environmental effects of accidental events on Special Areas are evaluated and assessed in Chapter 16 (Accidental Events).

12.1.4 Approach and Methods

The following sections provide an overview of the approach taken in the assessment of potential environmental effects resulting from routine Project activities on Special Areas. The analysis and description of potential environmental effects of the Project on this VC are based on consideration of the nature, scale and timing of the Project's planned components and activities (Chapter 2), and the existing environment for this VC (Section 6.4). 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.

The assessment for this VC considers what is known or can reasonably be deduced about Special Areas that are likely to be affected by Project activities in the LSA, with a focus on important defining features for which these areas have been identified and / or protected. The assessment and description of environmental effects and the identification of mitigation has been informed by a review of existing and available literature, including scientific studies and monitoring initiatives that have investigated and documented the actual effects of such activities on sensitive defining features of relevant Special Areas likely to be affected by Project activities. In addition, the planning process for this environmental assessment has included modelling to define the nature of potential interactions and effects resulting from Project-induced drill cuttings deposition, produced water deposition, and sound generation. A summary of the modelling is described in Section 4.3.4.

Planned Project components are considered in terms of their potential for interactions with, and effects on, the Special Areas VC, with a focus on the various potential environmental changes identified in Section 12.1.5. The effects assessment also considers the nature and anticipated

geographic extent of Project-related changes to the environment, as described in the other relevant VC Chapters and elsewhere in the EIS.

Chapter 6 identifies and describes the defining environmental features (and protection, as applicable) of special areas within the RSA, including recent or known upcoming changes to their status or their defined boundaries. As described in Table 6.73, there are 25 special areas (including multiple sponge and sea pen VMEs) that intersect with the LSA**,** primarily along the vessel traffic route (TR) in mid-shore to inshore areas. Table 12.3 provides the defining features of these special areas and their minimum distances to the LSA. Figure 12-2 illustrates the location of these special areas in relation to the LSA.

Table 12.2 Summary of Special Areas in the *L*SA

Special Area	Defining Features	Nearest Distance* to Special Area (km)		
		CBdN	PA	LSA
Canadian Ecologically and Biologically Significant Areas (EBSAs)				
Northeast Slope	Concentrations of corals. High aggregations of Greenland halibut and spotted wolffish (Threatened status) in spring. Aggregations of marine mammals particularly harp seals, hooded seals and pilot whales	89	31	Intersect
Eastern Avalon	Seabird feeding areas. Cetaceans, leatherback turtles and seals feed in the area from spring to fall	418	358	Intersect (TR)
Baccalieu Island	***Capelin spawning area. Aggregations of killer whales, shrimp, piscivores, spotted wolfish. Foraging area of Atlantic puffin, black-legged kittiwake and razorbill***	409	351	Intersect (TR)
Marine Refuges				
Northeast Newfoundland Slope Closure	High density of corals and sponges; high biodiversity. Bottom contact fishing activities prohibited to protect corals and sponges and contribute to long-term conservation	92	34	Intersect
Newfoundland and Labrador Shelves Bioregion Significant Benthic Areas				
Sea Pens	***Predicted presence probability of sea pens or large gorgonian corals***	***90***	***32***	***Intersect (1)****
Large Gorgonian Corals		***116***	***58***	***Intersect (TR) (1)***
Snow Crab Stewardship Exclusion Zones				
Near Shore (2 zones)	Crab fishing closure	415	356	Intersect (TR)
Coastal National Parks and Historic Sites				
Cape Spear National Historic Site	Historical lighthouse and lighthouse keeper's home, most eastern point of North America	460	401	Intersect (TR)
Signal Hill National Historic Site	Historic site of wireless communication and military defense of St. John's Harbour	463	405	Intersect (TR)

Table 12.2 Summary of Special Areas in the *L*SA

Special Area	Defining Features	Nearest Distance* to Special Area (km)		
		CBdN	PA	LSA
United Nations Convention on Biological Diversity (UNCBD) EBSAs				
Slopes of the Flemish Cap and Grand Bank	Aggregations of corals and sponges, high diversity of marine taxa including threatened and listed species. Greenland halibut fishery grounds in international waters	Intersect	Intersect	Intersect
Vulnerable Marine Ecosystems (VMEs)				
Sponge	***Concentrations of sponges, sea pens or corals***	***1***	***Intersect (3)***	***Intersect (6)***
Sea Pen		***Intersect (1)***	***Intersect (1)***	***Intersect (2)***
Large Gorgonian Coral		***31***	***Intersect (1)***	***Intersect (1)***
Northwest Atlantic Fisheries Organization (NAFO) FCAs				
Sackville Spur (6)	High sponge and coral concentration areas where bottom fishing is prohibited	32	3	Intersect
Northern Flemish Cap (9)		63	37	Intersect
Northwest Flemish Cap (10)		Intersect	Intersect	Intersect
Northwest Flemish Cap (11)		44	26	Intersect
Northwest Flemish Cap (12)		25	10	Intersect
Important Bird Areas (IBAs)				
Quidi Vidi Lake	Daytime resting site for gulls (e.g., herring, great black-backed, Iceland, glaucous, common black-headed) late fall to early spring; reported locally rare ring-billed gull, mew gull and lesser black-backed gull; waterfowl (e.g., American black ducks, mallards and northern pintails) common in winter	462	404	Intersect (TR)

**** All distances are calculated in NAD83 UTM Zone 23N Projection***

***** Note: For SBAs and VMEs, numbers in parentheses indicate the number of this type of special area intersecting with the CBdN, PA or LSA.***

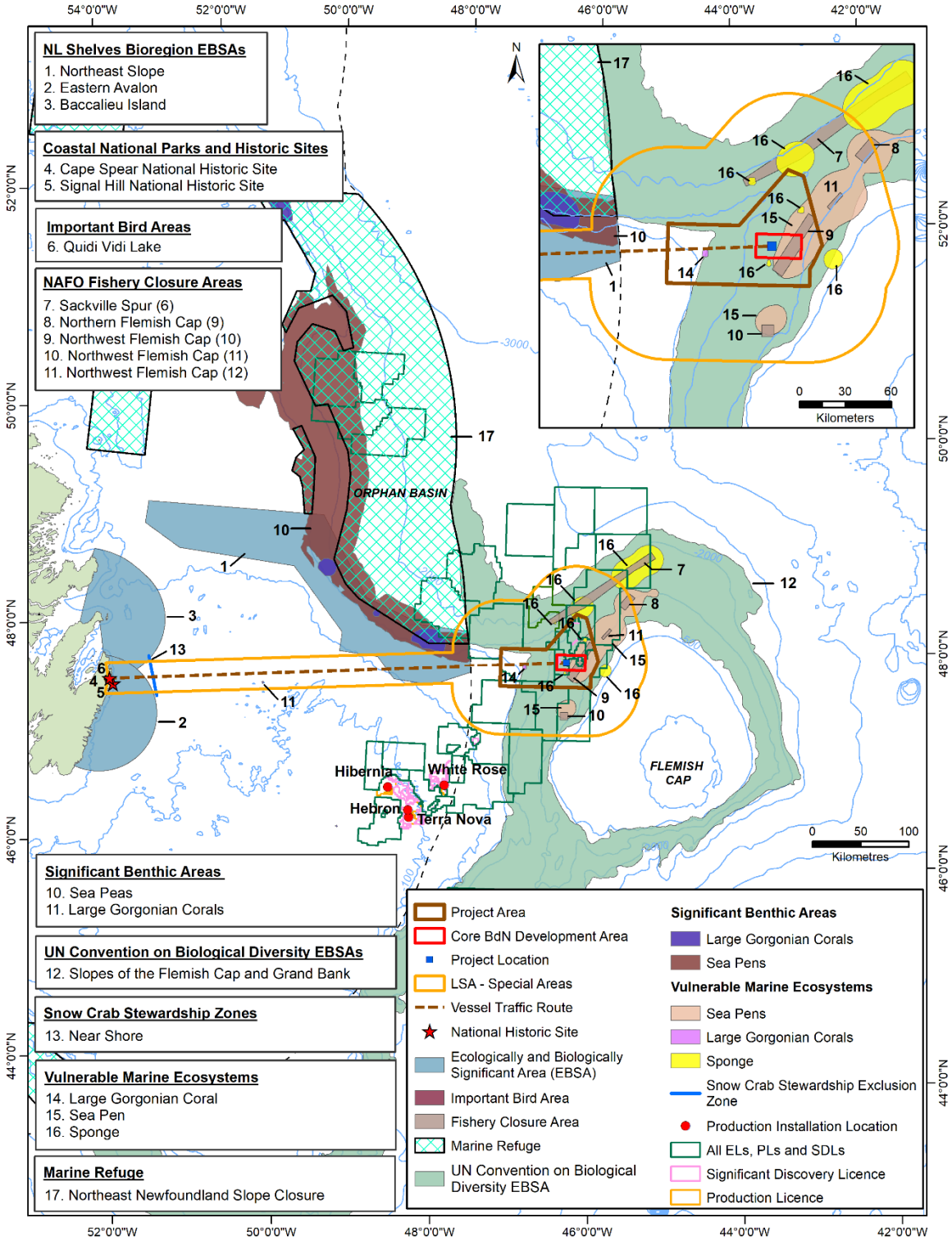

Figure 12-2 Overview of Special Areas Intersecting with the LSA

12.1.5 Potential Environmental Changes, Effects and Mitigation Measures

The following sections provide an overview of potential environmental effects resulting from routine Project activities on Special Areas. Mitigation measures to prevent or reduce adverse effects upon this VC are identified and considered integrally within and throughout the environmental effects analysis that follows, as applicable. The potential environmental effects of accidental events on Special Areas are evaluated and assessed in Chapter 16.

The assessment is focused on planned Project activities and their environmental interactions. To assist with the effects assessment, modelling was undertaken at representative sites within the Core BdN Development Area to evaluate the potential dispersion and predicted "footprint" of produced water and drill cutting discharges, and sound emissions, (Appendices J and I and D respectively).

12.1.5.1 Potential Project-Related Environmental Changes and Effects

Potential environmental interactions between planned Project activities and Special Areas have been identified through review of the Eastern Newfoundland Strategic Environmental Assessment (SEA) (Amec 2014), the Flemish Pass Exploration Drilling EIS (herein referred to as the Drilling EIS) (Statoil 2017), the information required by the Canadian Environmental Assessment Agency (the CEA Agency) arising from its technical review of the Drilling EIS (the "IRs"). In addition, the EIS Guidelines issued by the CEA Agency in September 2018 identify and specify a number of issues and potential effects on this VC that are also considered in the EIS (refer to Section 7.3.8.3 in Appendix A). Based on review of these resources, it has been determined that potential direct and indirect adverse effects on Special Areas that could be caused by Project activities are:

- Change in environmental features and / or processes
- Change in human use and / or societal value

Equinor Canada is currently in a *Canadian Environmental Assessment Act, 2012* (CEAA 2012) EA process for the Drilling EIS (Statoil 2017) and has received comments related to Special Areas. Comments were received during the formal public and regulatory review of the Drilling EIS (Statoil 2017), as well as ongoing engagement with Indigenous groups and stakeholders. In addition, as identified in Sections 3.3.1.2 and 3.4, comments and concerns have also been raised during Equinor Canada's ongoing engagement for the preparation of this EIS. Questions and comments resulting from Equinor Canada's engagement and EA review process are as follows and are addressed, as applicable to the scope of the assessment, herein.

Government Department and Agencies

- Potential effects of drilling wastes on sensitive benthic habitat (e.g., corals and sponges)
- Survey methodology for coral and sponge survey and the drill cuttings model
- Potential effects of disposal of discharges in the marine environment
- Use of marine mammal and bird observers

Indigenous Groups

- Potential effects of discharges (e.g., drill cuttings, produced water) and emissions on fish and sensitive benthic habitat (e.g., corals and sponges)
- Potential effects of vessel and helicopter traffic (including increased traffic, risk of vessel strikes, lighting, sound, emissions, discharges) on marine birds, whales, dolphins and seals
- Potential effects of sound, including geophysical testing, on marine life (i.e., mammals, birds, fish and fish habitat) and resulting changes in animal behavior
- Potential effects of artificial lighting, flaring and emissions on marine and migratory birds and marine mammals
- Potential effects on marine mammals (i.e., right whales and seals)

Stakeholder Organizations

- Potential effects on Marine Fish and Fish Habitat
- Potential effects on Marine and Migratory Birds
- Potential effects on Marine Mammals and Sea Turtles
- Potential effects on Commercial Fisheries and Other Ocean Uses
- Environmental effects monitoring (EEM)

The environmental effects assessment for this VC considers and focuses on the issues and questions identified through these issues scoping exercises, and as identified in Section 7.3.8.3 of the EIS Guidelines (Appendix A), including an initial identification of the key potential environmental changes and possible environmental effects on the VC that may result from them. These are summarized in Table 12.3, along with the identification of key parameters through which these Project-related changes and effects may be reflected.

Table 12.3 Potential Project-Related Environmental Changes and Resulting Effects: Special Areas

Potential Environmental Change	Potential Environmental Effect	Associated Parameter(s)
• Special areas have been identified under provincial, federal, and / or other legislation and processes because of their ecological, biological, historical, and/or socio-cultural characteristics and importance. • Direct or indirect changes to the existing natural or human environments resulting from Project-related interactions may affect key environmental characteristics and processes that define and distinguish special areas, and thus, affect their overall and underlying characteristics, integrity and value. • Disturbance, injury or mortality of benthic habitat and marine species, in special areas, resulting from sound, sedimentation, smothering, or direct contact. • Changes in presence, abundance, diversity, and health of marine species in special areas. • Changes in water quality that affect marine species endemic to special areas. • Attraction of marine species (endemic to special areas) to installations and vessels due to artificial lighting, and associated increased foraging, injury or mortality. • Disturbance of marine species (endemic to special areas) due to sound, lighting, or air emissions from supply vessels / aircraft. • Disturbance to human activities in special areas due to supply vessels / aircraft.	*Change in Environmental Features and / or Processes*	• Number, diversity and health of marine biota using the area • Marine habitat availability and quality within the area • Overall functioning, health and integrity of integral and defining ecological processes and features • Nature, intensity, quality and value of existing and defining human uses and activities within the special area • Type and degree of societal value placed on the special area and its defining characteristics
	Change in Human Use and / or Societal Value	

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.

Table 12.4 Potential Project-VC Interactions and Associated Effects: Special Areas

Project Component / Activity	Potential Environmental Effects		Associated Mitigations
	Change in Environmental Features and / or Processes	Change in Human Use and / or Societal Value	
CORE BdN DEVELOPMENT ACTIVITIES			
OFFSHORE CONSTRUCTION AND INSTALLATION, HOOK-UP AND COMMISSIONING			
Offshore Construction and Installation			
Presence of Vessels			
• Lighting			
• Sound			
• Discharges and Air Emissions			
Installation of Subsea Infrastructure (including potential protection)	•		A, C
Hook-up and Commissioning			
Presence of Vessels			
• Lighting			
• Sound			
• Discharges and Air Emissions			
HUC Activities			
• Marine Discharges			

Table 12.4 Potential Project-VC Interactions and Associated Effects: Special Areas

Project Component / Activity	Potential Environmental Effects		Associated Mitigations
	Change in Environmental Features and / or Processes	Change in Human Use and / or Societal Value	
PRODUCTION AND MAINTENANCE OPERATIONS			
Presence of FPSO and Subsea Infrastructure			
• Lighting			
• Sound			
Waste Management - Marine Discharges and Emissions			
• Produced Water			
• Other Waste Discharges			
• Air Emissions (including flaring)			
DRILLING ACTIVITIES			
Presence of Drilling Installation			
• Lighting			
• Sound			
Waste Management - Marine Discharges and Emissions			
• Drill Cuttings	•		B, E, F
• Other Waste Discharges			
• Air Emissions (including flaring)			
SUPPLY AND SERVICING			
Marine Vessels			
• Presence	•	•	D, G, I, J, M, N
• Lighting	•	•	
• Sound	•	•	
Aircraft (helicopters)			
• Sound	•	•	J, K
SUPPORTING SURVEYS			
Geophysical Activities			
• Presence of Vessels and Towed Equipment	•		D, G, O, M, N
• Lighting			
• Sound	•		L
Environmental, Geotechnical, Geological and ROV / AUV Surveys			
• Presence of Vessels			

Table 12.4 Potential Project-VC Interactions and Associated Effects: Special Areas

Project Component / Activity	Potential Environmental Effects		Associated Mitigations
	Change in Environmental Features and / or Processes	Change in Human Use and / or Societal Value	
• Lighting			
• Sound			
• Contact with Seabed	●		
DECOMMISSIONING			
Decommissioning of FPSO			
Decommissioning of Subsea Infrastructure	●		P
Well Decommissioning	●		Q, R
POTENTIAL FUTURE DEVELOPMENT			
Offshore Construction and Installation, and HUC	●		A, C
Production and Maintenance Operations			
Drilling Activities	●		B, E, F
Supply and Servicing	●	●	D, G, I, J, M, N, K
Supporting Surveys	●	●	D, G, O, M, N, L
Decommissioning	●		P, Q, R

12.1.5.2 Summary of Mitigation Measures

The following sections provide an assessment and evaluation of the potential effects of the Project on Special Areas. Mitigation measures to prevent or reduce adverse effects upon upon the special areas and the features for which they have been identified, as listed below, are identified and considered in an integrated manner within and throughout the environmental effects analysis that follows, as applicable. Mitigations for the associated interactions are identified in Table 12.4. The environmental effects assessment for accidental events for VCs is presented separately in Chapter 16.

A. With regards to subsea layout, well templates will not be placed over *Lophelia Pertusa* corals
B. 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 100m^2 with heights greater than 30 cm within 100 m of the discharge location.
C. 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.

D. Ballast water and hull fouling will be managed in consideration of applicable Canadian and international requirements to reduce the potential spread of invasive species.
E. In consideration of the Offshore Waste Treatment Guidelines (OWTG) (NEB et al. 2010) and regulatory discharge limits, for discharges associated with the Project, the use of best treatment practices that are commercially available and economically feasible will be implemented.
F. The selection and screening of chemicals to be discharged, will be undertaken in consideration of the Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands (OCSG) (NEB et al. 2009) and Equinor Canada's chemical selection and screening processes.
G. Sewage and food waste will be treated in consideration of the OWTG and in accordance with Canadian and international regulatory requirements (e.g., IMO).
H. Appropriate procedures will be implemented for the handling, storage, transportation, and onshore disposal of solid and hazardous waste.
I. Use of common traffic routes for vessels and helicopters will be used where possible and practicable
J. Helicopter flight paths and offshore supply vessel (OSV) transit routes will adhere to the periods of avoidance, and specific set back distances, associated with specific, established migratory bird nesting colonies outlines in the *NL Seabird Ecological Reserve Regulations, 2015* and in consideration of federal guidelines in order to reduce disturbance to colonies.
K. Low-level aircraft (helicopters) operations will be limited or avoided where it is not required per Transport Canada protocols.
L. In consideration of the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2018), mitigation measures applied during the Project's geophysical surveys where air source arrays are used will be consistent with those outlined in the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP) (DFO 2007).
M. 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.
N. In the unlikely event of a collision with a marine mammal or sea turtle, Equinor Canada will contact DFO.
O. Communications and notifications of Project activities, as applicable, with commercial fisheries and other ocean users (see Section 13.1.5.2 for a complete list)
P. A decommissioning plan will be developed and submitted to the C-NLOPB for review and acceptance. The plan will be made in consideration of regulatory requirements, engagement with Indigenous groups, commercial fisheries and other stakeholders and likely effects on the environment.
Q. Use of explosives will not be employed for removal of wellheads.
R. At the time of decommissioning a well, the well will be inspected in accordance with applicable regulatory requirements.

12.2 Core BdN Development Area

The Core BdN Development includes six broad phases / categories of activities (Table 12.3):

- Offshore construction and installation, and HUC
- Production and maintenance operations
- Drilling activities
- Supply and Servicing
- Supporting Surveys
- Decommissioning

The assessment in the following sections is based on these activities and associated interactions.

Some or all of these activities may also be part of Potential Future Development activities which may occur in the larger Project Area; the interactions and potential environmental effects are discussed in Section 12.3.

12.2.1 Offshore Construction and Installation, and Hook-Up and Commissioning

Offshore construction and installation, and HUC refers to activities that will occur offshore in the Core BdN Development Area, which are described in Section 2.6.1.

As indicated in Table 12.4, the effects assessment is focused on installation of subsea infrastructure and potential protection measures during offshore construction and installation. Activities associated with the installation include but are not limited to: supply and servicing (vessels and helicopters), pre-clearance surveys, site preparation, environmental, geotechnical, geological, and/or ROV / AUV surveys, which are assessed separately in Sections 12.2.4 and 12.2.5.

12.2.1.1 Offshore Construction and Installation

Installation of Subsea Infrastructure (including Potential Protection)

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. This may also result in exposure, injury, and / or mortality of benthic organisms, including corals, sponges and sea pens, through direct contact, burial by deposition of cuttings and the introduction of suspended solids in the water (Whatling and Norse 1998; Thrush and Dayton 2002; Clark et al. 2016; Cordes et al. 2016). These organisms are vulnerable to physical disturbance due to their low avoidance capabilities (Clark et al. 2016; Cordes et al. 2016). Marine fish may also be present in this special area and the effects on fish are discussed in Section 9.2.1.

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). An increase or change in suspension solids may clog feeding structures of filter-feeding organisms, including corals, sponges, and sea pens (Bell et al. 2015; Liefmann et al. 2018; Vad et

al. 2018). Further, coral and sponge biogenic habitats, where habitat is created by an organism itself, are fragile and recover slowly (Cordes et al. 2016).

12.2.1.2 Summary of Environmental Effects

Offshore Construction and Installation

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, medium-term in duration, occurring regularly when these activities are ongoing, and reversible. This prediction is made with a high level of confidence.

12.2.2 Production and Maintenance Operations

Activities associated with production and maintenance operations are described in Section 2.6.2. As stated in Section 12.1.5.1, and indicated in Table 12.4, there are no interactions between production and maintenance and those special areas within the Core BdN Development Area.

12.2.3 Drilling Activities

As described in Section 2.6.3, the Core BdN Development may involve the drilling of up to 40 wells over a period of three to five years. Wells will either be drilled using templates (multiple wells drilled in one location) or at individual well locations (satellite wells). Drilling may be carried out by one or more drilling installations, which may operate concurrently. Refer to Section 2.6.3 for a description of drilling activities. As listed in Table 12.4, the effects assessment is focussed on the discharge of drill cuttings.

12.2.3.1 Waste Management – Marine Discharges and Emissions

Drill Cuttings

Drilling will include discharge of synthetic-based mud (SBM) and water-based mud (WBM) associated drill cuttings. Corals and sponges, such as those that may be present in these Special Areas, are particularly sensitive to deposited drill cuttings and suspended mud particles as well as smothering through burial (Larsson and Purser 2011; Allers et al. 2013; Bell et al. 2015; Purser 2015; Järnegren et al. 2016; Ragnarsson et al. 2017; Liefmann et al. 2018; Vad et al. 2018, Baussant et al., 2018). Suspension-feeding structures of sessile species may become clogged by suspended drill cuttings or sediment (Neff et al. 2000; Smit et al. 2006). Increased larval mortality and change in feeding behaviour of corals has been identified due to exposure to cuttings particles (Raimondi et al. 1997, Neff 2010; Buhl-Mortensen et al. 2015; Järnegren et al. 2016; Ragnarsson et al. 2017), although some corals have higher tolerance to drill fluid deposition (Allers et al. 2013).

WBMs have varied effects on marine species but due to the non-toxic nature of the drilling fluid components (Neff 2010), are not likely to result in chemical toxicity (Holdway 2002; Trannum et al. 2010, 2011; Bakke et al. 2013; Purser 2015). Released WBM and WBM-associated drill cuttings resulting from the Project have potential for low adverse effects as these materials are associated with low toxicity, have low bioaccumulation and only localized biological effects (Deblois et al. 2014).

Acute toxicity of SBMs is considered to be relatively low based on laboratory experiments and field evaluations of SBM-associated drill cuttings piles (Still et al. 2000; Tsvetnenko et al. 2000; Hamoutene et al. 2004; Paine et al. 2014; Tait et al. 2016). Potential effects on these special areas are likely to be temporary in nature as SBMs biodegrade within a few years (Terrens et al. 1998; Ellis et al. 2012; IOGP 2016). As previously stated, Equinor Canada will use proven and practicable best available technologies and practices for the treatment of SBM cuttings prior to discharge.

As described in Section 9.2.3.2, drill cuttings modelling for the Core BdN Development Area, at a site within the Northwest Flemish Cap (10) FCA, indicated that cuttings were primarily localized to within 200 m of the wellsite. In general, drill cuttings overlap among sites 1 km away from the wellsite would be unlikely due to the patchy nature of discharged cuttings at this distance. Recolonization of the drill cuttings pile may start as early as one year after cessation of activity with diminished effects three to 10 years after cessation of activity. Recolonization of the drill cuttings pile may start as early as one year after cessation of activity with diminished effects 3 to 10 years after cessation of activity.

Section 9.2.3.2 provides a full discussion regarding the potential effects of drill cuttings and drill cuttings model results, which is also applicable to Special Areas.

12.2.3.2 Summary of Environmental Effects

Waste Management – Marine Discharges and Emissions

In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from the discharge of drill cuttings are predicted to be adverse, low in magnitude, localized, medium- to long-term in duration due to recolonization of drill cuttings, occurring regularly, and reversible. This prediction is made with a high level of confidence.

12.2.4 Supply and Servicing

The Project will involve marine vessel, including shuttle tankers, and aircraft use (presence and movements), including supply and support traffic to, from and within the Core BdN Development Area and Project Area at all times of the year throughout the Project duration. Supply and servicing is described in Section 2.6.4.

As indicated in Section 12.1.5.1 and Table 12.4, vessels and helicopters may interact with seven Special Areas (Table 12.2) as a result of vessel presence and lighting and/or sound (vessels and helicopters) along the vessel traffic route. As indicated in Table 12.2, the defining features of these special areas are identified for the presence of Marine Fish and Fish Habitat, Marine and Migratory Birds, Marine Mammals and Sea Turtles, other users.

Special Areas in the LSA most regularly used by humans for recreation, subsistence, or tourism activities, are in coastal and onshore areas which are approximately 500 km from the Project. Users of these special areas could potentially experience increased sound from marine vessel and helicopter traffic, but such sound is generally consistent with the overall marine traffic that has occurred throughout the region for many years. Chapter 13 determined that the Project is unlikely to have significant adverse effects on the Commercial Fisheries and Other Ocean Uses. Therefore, it is not likely to adversely affect the human and societal use, of special areas found in the LSA along

the vessel traffic route. As discussed in Section 9.2.4, Supply and Servicing is not anticipated to result in interactions with benthic habitats.

12.2.4.1 Marine Vessels

Presence of Vessels

The Northeast Slope EBSA is also identified for high aggregations of Greenland halibut and spotted wolffish, the latter of which is a species at risk (SAR) (listed as Threatened by the *Species at Risk Act* and COSEWIC). Although the presence of marine vessels may result in some level of attraction, avoidance or other behavioural responses by individual fish and invertebrates due to light and sound emissions (Røstad et al. 2006; De Robertis and Handegard 2013), marine fishes and invertebrates will likely not be disturbed by Project-related vessel activity given its transitory nature and short-term presence at any one location. The high aggregations of wolffish species outside the Core BdN Development Area and use of planned and mitigation measures will avoid or reduce such adverse interactions with these species. The potential effects of the presence of vessels on marine fish species (including SAR) are discussed in detail in Section 9.2.4.

The LSA intersects special areas (i.e., Eastern Avalon EBSA, Baccalieu Island EBSA, and Quidi Vidi Lake IBA), including coastal feeding, resting and wintering areas, that have been identified for diverse marine and migratory bird populations. Vessel traffic may affect Marine and Migratory Birds through lighting, sound, marine discharges and other associated environmental emissions and discharges.

Marine and Migratory Birds are vulnerable to changes in the abundance of prey species (e.g., fish, plankton, cephalopods) on which they may rely for food and the presence of vessels may also disrupt foraging activities. Conversely, while supply vessels are on safety stand-by, they travel at very low speeds within a 5 km radius of an FPSO and / or drilling installation. Vessel lighting at night may attract some fish species to the surface, which in turn attracts great black-backed gull and other gull species for improved foraging opportunities (Davis et al. 2017).

Project-related vessels have the potential to result in mortality or injury of Marine Mammals and Sea Turtles due to vessel strikes. All six baleen whale species found in the Northwest Atlantic, including humpbacks that are common in the eastern Avalon, are documented to have been struck by ships (Jensen and Silber 2003). Also, potential exists for Project vessels to strike sea turtles resulting in injury or mortality. Propeller and collision injuries from boats and ships are common in sea turtles, at least in U.S. waters (NMFS 2008). As indicated in Section 11.2.4, the potential for vessel strikes on Marine Mammals and Sea Turtles is unlikely.

Presence and operation of vessels may result in adverse effects, primarily through attraction or avoidance leading to some increased potential for mortality / injury or health effects to marine species in these special areas. However, these will be avoided or reduced through the various mitigation measures identified in Chapters 9, 10 and 11 and will not result in population-level effects.

Lighting

Birds are likely to experience some localized and short-term behavioural effects (change in presence and abundance), with some species being displaced from the LSA and others attracted by lighting.

The greatest potential for interaction between artificial light emissions and Marine and Migratory Birds is in the attraction of Leach's storm-petrels, of which large numbers nest at Baccalieu Island. Tracking of storm-petrels nesting at seven colonies in Atlantic Canada during incubation shows that adults nesting at Baccalieu Island and Witless Bay colonies forage in the Flemish Pass and adjacent areas, averaging 4 days per foraging trip (Hedd et al. 2018). There may be a slight increase in mortality / injury levels due to collisions and disorientation resulting in birds being stranded on vessels although the mortality rate is anticipated to be low as most birds stranded on platforms and vessels are released successfully. Light attraction has also been reported for Atlantic puffins in coastal areas near nesting colonies in both Scotland and Newfoundland (Miles et al. 2010; Wilhelm et al. 2013).

Given that the likely zone of influence of the Project at one time or location will intersect with a small proportion of the feeding, breeding or migration area of species, birds (found in these special areas) will not be displaced from key habitats or during important activities or be otherwise affected in a manner that causes adverse and detectable effects to overall populations in the region. Changes in habitat and food availability and quantity will also be on a localized scale and for a short-term duration.

Project-related supply vessel traffic represents a negligible contribution to general vessel traffic off eastern NL, and support vessels will use existing and common routes wherever possible. Vessels will avoid coastal seabird colonies during the nesting season as per the *Seabird Ecological Reserve Regulations, 2015* and federal guidelines. The various bird species that occupy special areas within the LSA will not likely be affected by supply vessels activity, due to its transitory nature and thus, its short-term presence at any one location, and because it is generally consistent with the overall marine traffic that has occurred throughout the region for years.

Presence and operation of vessels may result in adverse effects on avifauna, primarily through attraction or avoidance behaviour associated with lighting and other potential environmental interactions and emissions leading to some increased potential for individual mortality / injury or health effects. However, these will be avoided or reduced through the various mitigation measures identified in Chapter 10 and will not result in population-level effects.

Sound

Marine Mammals and Sea Turtles in special areas such as the Northeast Slope EBSA and Eastern Avalon EBSA, have the potential to interact with the Project. However, key issues are generally limited to the effects (i.e., hearing impairment, injury, masking, behavioural responses) of underwater sound and to the potential for Project vessels to strike a marine mammal and / or sea turtle resulting in injury or mortality. Continuous sounds produced by vessels (as well as dynamic positioning thrusters) do not typically exceed threshold levels for temporary or permanent changes in hearing ability (Richardson et al. 1995; Nowacek et al. 2007; Southall et al. 2007; NMFS 2016).

Vessel sound, through masking, can reduce the effective communication distance of a marine mammal if the frequency of the sound source is close to that used by the animal, and if the sound is present for a substantial length of time (e.g., Richardson et al. 1995; Clark et al. 2009; Jensen et al. 2009; Gervaise et al. 2012; Hatch et al. 2012; Rice et al. 2014; Erbe et al. 2016; Jones et al. 2017; Putland et al. 2017). In addition to the frequency and duration of the masking sound, the strength, temporal pattern, and location of the introduced sound also play a role in the extent of the masking

(e.g., Branstetter et al. 2013, 2016; Finneran and Branstetter 2013). Sound could also be a potential source of stress for marine mammals in special areas (e.g., Wright et al. 2011; Atkinson et al. 2015).

Marine mammal responses to vessels are variable and range from avoidance at long distances to little or no response or approach (Richardson et al. 1995). Seals often show considerable tolerance to vessels but may also show signs of avoiding vessel traffic. Baleen whales, such as humpbacks, often interrupt their normal behaviour and swim rapidly away from vessels that have strong or rapidly changing sound, especially when a vessel heads directly towards a whale. Stationary vessels or slow-moving, “non-aggressive” vessels typically elicit very little response from baleen whales. Overall, marine mammals (and likely sea turtles) may exhibit minor, short-term disturbance responses to underwater sounds from vessels.

Presence and operation of vessels may result in localized effects, primarily through avoidance behaviour associated with sound and other potential environmental interactions leading to some increased potential for changes in individual mortality / injury or health effects. As stated in Section 11.2.4.1, the localized, transient, and short-term nature of these disturbances at one location and time during the Project reduces the potential for adverse effects upon Marine Mammals and Sea Turtles. It is unlikely that individuals will be displaced over extended areas or timeframes. Potential effects will be reduced through the various mitigation measures identified in Chapter 11 and will not result in population-level effects.

12.2.4.2 Aircraft (Helicopters)

Sound

The Project will use helicopters to transport personnel and supplies to the offshore installation year-round during Project life. Aircraft traffic may affect seabirds through lighting, sound, and other associated environmental emissions and discharges. The primary interaction associated with helicopter use is the possible disturbance effects of aircraft overflights on birds, including 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, as cited in Statoil 2017).

Chapter 10, which provides detailed information on the potential effects on Marine and Migratory Birds, concluded that interactions with and effects on coastal breeding colonies are unlikely. Figure 6-50 identifies the locations of bird colonies within the RSA and along the coast of Newfoundland. These areas are not within the typical flight path of aircraft from the St. John’s International Airport to the Project. The nearest Special Area identified for Marine and Migratory Birds (i.e., Quidi Vidi Lake IBA) is not noted for nesting colonies. The nearest Special Area with nesting seabirds, Eastern Avalon EBSA, is 40 km south of St. John’s International Airport. Therefore, the amount of time these aircraft are near sensitive coastal habitats will be limited. To minimize disturbance to birds, low-level aircraft operations will be avoided, as appropriate. In addition, Project aircraft operations will avoid known and observed bird colonies, large aggregations of avifauna, important habitats and protected or sensitive areas and times wherever possible. This includes avoidance of helicopter use near seabird breeding colonies during the times outlined in the *Seabird Ecological Reserve Regulations*, 2015.

Available information indicates that single or occasional aircraft overflights, such as helicopters used for crew transfers, will cause no more than brief behavioural responses in baleen whales and seals (summarized in Richardson et al. 1995), which are found in Special Areas in the LSA. It is unknown how sea turtles would respond, but single or occasional overflights by helicopters would likely only elicit a brief behavioural response.

Presence and operation of aircraft may result in adverse effects, primarily through avoidance behaviour and other potential environmental interactions leading to some increased potential for changes in individual mortality / injury or other health effects. However, these will be avoided or reduced through the various mitigation measures identified in Chapter 10 and 11 and will not result in population-level effects.

12.2.4.3 Summary of Environmental Effects

Marine Vessels

In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from marine vessels are predicted to be adverse, low in magnitude, within the LSA, long-term in duration, occurring regularly, and reversible. This prediction is made with a moderate to high level of confidence.

Aircraft (Helicopters)

In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from aircraft (helicopters) 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.

12.2.5 Supporting Surveys

Supporting surveys associated with the Project are described in Section 2.6.5, and may include geophysical activities, environmental, geotechnical, geological and ROV / AUV surveys.

The principal aspects of the supporting surveys that have potential to cause effects are from underwater sound and vessel presence The Northeast Slope Canadian EBSA (Table 12.6), which is identified for concentrations of cetaceans and pinnipeds, is greater than 30 km from the edge of the Project Area and thus within the zone of influence for potential effects on marine mammals and sea turtles from seismic sound emissions(a 50 km LSA has been established for the Marine Mammals and Sea Turtles VC). Section 11.2.5 discusses the potential effects of supporting surveys on Marine Mammals and Sea Turtles in detail.

12.2.5.1 Geophysical Activities

As described in Section 2.6.5, geophysical surveys may be undertaken in support of the Project. It is estimated that 4D seismic surveys associated with permanent reservoir monitoring may take approximately two to four weeks to complete and occur as frequently as once per year in early Project life, with reduced frequency in later years.

The primary potential effector associated with geophysical activities is the sound produced by discharging air sources. In the case of 4D seismic surveying, receivers would either be placed on the seafloor or towed behind a vessel. If placed on the seafloor there would be an interaction with the benthic environment.

Presence of Vessels and Towed Equipment

Potential effects associated with vessel presence on Special Areas are described in Section 12.2.4.

The potential effects of seafloor receivers would be similar to subsea infrastructure as described in Section 12.2.1.1 but limited considering the smaller footprint.

Sound

Underwater sound generated by geophysical activities (i.e., seismic surveys) has the potential to affect marine species. The Northeast Slope EBSA is, at its closest point, approximately 89 km from the Core BdN Development Area and 34 km from the Project Area. Sections 9.2.5 and 11.2.5 present a detailed discussion on the potential effects of sound from geophysical surveys on Marine Fish and Fish Habitat and Marine Mammals and Sea Turtles, respectively.

Marine mammals occurring in the Northeast Slope EBSA will not be exposed to sound levels from Project geophysical activities that are known or expected to cause auditory injury. Based on available scientific studies and acoustic modelling undertaken for the EIS (Zykov 2018 in Appendix D), any such effects on marine mammal hearing are predicted to occur within 10s to 100s of metres of the air source array. There is a possibility that marine mammals, particularly mysticetes (which are low-frequency hearing specialists), in the Northeast Slope EBSA may exhibit minor behavioural responses to air source sound emitted in the Core BdN Development Area, but available information generally indicates that behavioural responses (particularly avoidance) is much more localized and also short-term. 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. In summary, given the distance of the Northeast Slope EBSA from the Core BdN Development Area and Project Area, there is limited potential for geophysical activities to affect marine mammals which occur in the Northeast Slope EBSA. Any behavioural effects on marine mammals would likely be minor and short-term.

Based on available scientific literature and as summarized generally for fishes in Section 9.2.5.1, marine invertebrates and fishes in these special areas will not be exposed to levels of Project-associated sound that have potential to cause either physical or behavioural effects.

12.2.5.2 Environmental, Geotechnical, Geological and ROV / AUV Surveys

Environmental surveys are used to collect samples to characterize the physical, chemical, and biological aspects of the selected area. Sampling is typically carried out from an OSV or dedicated vessel suitable to the survey. Environmental surveys may include oceanography, meteorology, and ice / iceberg surveys. They can also include biota, water, and sediment sample collection, and ROV / AUV-video or drop camera surveys. Environmental surveys may occur throughout Project life at

any time of the year using vessels of opportunity associated with the Project. Surveys could last up to six weeks, depending on weather and technical delays.

Geotechnical surveys measure the physical properties of the seabed and subsoil through the collection of sediment samples and in situ testing. Methods to collect samples typically include borehole drilling or gravity coring. In- situ testing is done through cone penetration testing and pore pressure measurements. Installation of piezometers in boreholes to measure soil properties may also be carried out. Piezometers could be left in place to collect data for up to 12 months or longer. Geotechnical surveys may occur throughout the Project life at any time of the year, using dedicated vessels provided by marine geotechnical specialist suppliers. Geological surveys may use a variety of methodologies including, but not limited to towed or ROV/AUV-mounted seabed camera/video system, grab samplers, gravity or piston corer, box corer, and other sampling gear.

12.2.5.3 Summary of Environmental Effects

Geophysical Activities

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 medium to high level of confidence.

Environmental, Geotechnical, Geological and ROV / AUV

In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from these surveys are predicted to be adverse, negligible in magnitude, localized, short-term in duration, occurring sporadically, and reversible. This prediction is made with a high level of confidence.

12.2.6 Decommissioning

At end of field-life, which will either be at the end of the Core BdN Development or at the end of Project life, should Potential Future Development occur, the Project will be decommissioned in accordance with regulatory requirements in place at the time of decommissioning. Activities associated with decommissioning include, but are not limited to, vessel and helicopter supply and servicing, removal of infrastructure, environmental, geotechnical, geological and/or ROV / AUV surveys are assessed above in Sections 12.2.4 and 12.2.5.

12.2.6.1 Decommissioning of Subsea Infrastructure

Subsea infrastructure, including flowlines and well templates may be removed or left in place. These options will be further examined at the time of decommissioning in consultation with C-NLOPB and other regulatory authorities such as DFO. Over time, and depending on potential protection measures, infrastructure may have become fish habitat and the effects of removing them would have to be assessed.

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 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, recovery and recolonization of the area would may be enhanced if the infrastructure had supported connectivity to areas previously inaccessible by benthic invertebrates.

12.2.6.2 Well Decommissioning

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.

12.2.6.3 Summary of Environmental Effects

In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from decommissioning are predicted to be adverse, negligible to low in magnitude, localized, medium-term in duration, occurring regularly, and reversible. This prediction is made with a high level of confidence.

12.3 Potential Future Development

Over the life of the Project, Equinor Canada may choose to undertake additional exploration activities (e.g., exploration, appraisal, delineation drilling, 2D, 3D/4D seismic) to search for and possibly develop economically recoverable reserves. Should additional economically and technically recoverable reserves be discovered within the Project Area, they could be processed on the FPSO through the installation of additional subsea well templates and flowlines (as described in Section 2.6.6). Between one and five subsea developments could be tied-back to the FPSO and may include the drilling of up to 20 additional wells. Activities associated with Potential Future Development would be the same as those described in Section 2.6.6. The Core BdN Development has a field life of 12 to 20 years. Should future development occur, the field life of the Project would be extended while maximum daily potential production rates would remain the same. Tie-backs to the FPSO may be feasible up to approximately 40 km from the installation location. Potential Future Development activities could therefore include exploration and development activities on Equinor Canada held

lands within the Project Area. For the purposes of the EA, it is assumed that the timeframe for Potential Future Development would the same as those listed for the Core BdN Development. For instance, it is assumed that offshore construction and installation and HUC activities would occur over several seasons; production and maintenance operations, supply and servicing and supporting surveys would continue until the 30-year end of Project life (an additional 10 to 18 years). All mitigation implemented for the Core BdN Development Area would also be applied to Potential Future Development (see Section 12.1.5.2).

12.3.1 Offshore Construction and Installation, and Hook-up and Commissioning

Potential Future Development of up to five additional subsea developments (flowlines, well templates / individual wells) and associated tie-backs would involve seabed surveys and site preparation, installation of subsea infrastructure, and eventual HUC.

The potential interactions and effects of offshore construction and installation for Potential Future Development would be the same as those assessed in Section 12.2.1 for the Core BdN Development Area. Activities would likely be seasonal but could occur year-round.

In summary, with the application of mitigation measures, the residual environmental effects to Special Areas from offshore construction and installation are predicted to be adverse, low in magnitude, within the Project Area, medium-term in duration, occurring regularly when these activities are ongoing, and reversible. This prediction is made with a high level of confidence.

12.3.2 Production and Maintenance Operations

As stated in Section 12.1.5.1, and indicated in Table 12.4, there are no interactions between production and maintenance and those special areas within the Project Area. .

12.3.3 Drilling Activities

Up to 20 additional wells may be drilled at either individual well locations or in well templates (4-,6- or 8-slot), similar to the Core BdN Development Area in Section 12.2.3. Drilling activities could occur at any time of the year. The longer life of the Project would also potentially increase the amount of well interventions and workovers, introducing short-term sound and equipment presence effects sporadically during Potential Future Development

Drill cuttings dispersion modelling from the Drilling EIS (Statoil 2017) provide an estimation of cuttings dispersion in a shallower depth of approximately 360 m, which is comparable to the shallower depths of the Project Area (approximately 340 m). Modelling at 360 m depth on the northeast slope of the Grand Banks indicated that released drill cuttings settled primarily between 100 m to 1 km away from the wellsite across seasonal scenarios at maximum thicknesses of 1-80 mm and average thicknesses of less than 5 mm (Statoil 2017). From 1 km to 2 km average thickness ranged from 0.6 mm to 2mm for WBM cuttings and less than 0.01 for SBM cuttings. Drill cuttings thicknesses were less than 0.01 mm across seasonal scenarios beyond 2 km for WBM and SBM drill cuttings. Drill cuttings modelling for the Core BdN Development Area at approximately 1,200 m indicated that cuttings were mainly localized to within 200 m of the wellsite. In general, drill cuttings overlap among

sites 1 km away from the wellsite would be unlikely due to the patchy nature of discharged cuttings at this distance. Recolonization of the drill cuttings pile may start as early as one year after cessation of activity with diminished effects three to 10 years after cessation of activity.

In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from drilling activities are predicted to be adverse, low in magnitude, within the Project Area, medium- to long-term in duration due to recolonization of drill cuttings, occurring regularly, and reversible. This prediction is made with a high level of confidence

12.3.4 Supply and Servicing

Supply and servicing operations, including shuttle tankers, would the same as those assessed for the Core BdN Development Area in Section 12.2.4. These activities would be the same should Potential Future Development activities be undertaken. It is not anticipated that there would be additional OSVs, helicopters or tankers beyond the ranges of vessels described above and in Chapter 2.

In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from supply and servicing are predicted to be adverse, low in magnitude, within the LSA, long-term in duration, occurring regularly, and reversible. This prediction is made with a moderate to high level of confidence.

12.3.5 Supporting Surveys

Supporting surveys, including geophysical activities, environmental, geotechnical, geological and ROV / AUV surveys may be required during Potential Future Development activities. Should supporting activities be required, they would be the same as described in Section 2.6.5. As the level of supporting surveys are not predicted to increase from Core BdN Development Activities to Potential Future Development, the effects assessment would be the same as described in Section 12.2.5.

In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from supporting surveys 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 to high level of confidence.

12.3.6 Decommissioning

At end of field-life, which will either be at the end of the Core BdN Development or at the end of Project life, should Potential Future Development occur. The potential effects associated with decommissioning are described in Section 12.2.6.

In summary, with the application of mitigation measures, the residual environmental effects on Special Areas from decommissioning are predicted to be adverse, negligible to low in magnitude, within the Project Area, medium-term in duration, occurring regularly, and reversible. This prediction is made with a high level of confidence.

12.4 Significance of Residual Effects of the Project

This section summarises the residual environmental effects of the Project on the Special Areas VC and presents the determination of significance.

12.4.1 Residual Environmental Effects Summary

Special Areas have been selected as a VC for this EIS due to their importance for environmental, economic, and / or socio-cultural reasons and associated regulatory and / or Indigenous and stakeholder interests and their intrinsic ecological or anthropogenic value.

Special areas intersecting with the LSA have been identified for the presence of sensitive benthic habitats and species, fish species and marine mammals. Various offshore special areas have been closed to bottom contact fishing to protect sensitive benthic habitats from bottom fishing activities, but with no associated prohibitions of petroleum exploration and development activities within their boundaries. Coastal special areas are identified for the presence of Marine and Migratory Birds.

Human use of the special areas is mainly limited to activities such as marine fisheries, oil and gas exploration and production, and marine transportation. There is limited commercial fisheries within the Project Area. Special areas used by humans for tourism and recreation are located in coastal and nearshore environments. Potential Project effects on human uses of marine and coastal environments, including fisheries, recreation and tourism, are addressed in Commercial Fisheries and Other Ocean Uses (Chapter 13).

The potential effects of planned Project activities (e.g., seabed contact, sound, light, marine discharges) on Marine Fish and Fish Habitat, Marine and Migratory Birds, and Marine Mammals and Sea Turtles such as those found in the Special Areas, are discussed in Chapters 9, 10 and 11 of the EIS. Project activities have the potential to result in residual effects on defining features of special areas that intersect with LSA. A number of planned Project activities in the Project Area 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. Project disturbances to benthic habitat will be localized and of medium-term in duration. Subsea infrastructure and drill cuttings deposition will represent small areas of disturbance to benthic habitats within the extensive areas of marine environment of special areas in the offshore. In addition, subsea infrastructure may provide habitat replacement for corals and sponges. Mitigations applicable to benthic habitat will be implemented to prevent or reduce environmental effects on the defining features of these special areas.

Light and sound emissions from vessel within the vessel traffic route of the LSA, may result in result in temporary behavioural changes in marine species, such as foraging or migration. These effects will be relatively localized or occurring in a transient manner along the vessel traffic route through

the LSA. The implementation of mitigation measures outlined throughout this EIS to reduce direct or indirect potential effects on the Marine Fish and Fish Habitat, Marine and Migratory Birds, and Marine Mammals and Sea Turtles VCs will prevent or reduce environmental effects on the defining features of these special areas.

Offshore vessel and aircraft activity in the LSA to and from eastern NL will make a relatively minor contribution to, the overall marine vessel activity occurring in the region. Supporting vessels that are involved in Project activities will travel in an essentially straight line between the Core BdN Development and the Project Area and the established supply facility, recognizing that specific routes may vary at times based on the location of Project activities and to avoid sea-ice. The planning and conduct of Project-related vessel traffic will be undertaken in consideration of these factors, relevant regulatory requirements and through established cooperative processes that involve discussions and communications between the oil and gas sector and Commercial Fisheries and Other Ocean Uses.

Table 12.5 and Table 12.6 summarize the environmental effects assessment for the Core BdN Development and Potential Future Development that comprise the Project being assessed under CEAA 2012

12.4.2 Determination of Significance

As described for the various preceding biophysical VCs (Chapters 9, 10 and 11), the Project is not expected to result in significant adverse effects on Marine Fish and Fish Habitat, Marine and Migratory Birds, Marine Mammals and Sea Turtles, SAR or their habitats. Chapter 13 determined that the Project is also unlikely to have significant adverse effects on the Commercial Fisheries and Other Ocean Uses. As a result, the Project is not likely to result in a detectable adverse change in one or more of the important and defining ecological and sociocultural characteristics of such an area, resulting in a decrease in its overall integrity, value and use.

Therefore, it is predicted that the Project will not to result in significant adverse effects on Special Areas. This conclusion has been reached with a moderate to high level of confidence. The confidence rating is generally high with moderate confidence related to the effects of sound on marine mammals and sea turtles in special areas. This conclusion is based on the nature and scope of the Project, knowledge about the existing environment with the LSA and RSA, and current understanding of the effects of similar projects on the VC and relevant, planned mitigation measures.

Table 12.5 Environmental Effects Assessment Summary: Special Areas – Core BdN Development

<table>
<tr><th colspan="9">ENVIRONMENTAL EFFECTS ASSESSMENT SUMMARY</th></tr>
<tr><td colspan="3">Summary of Existing Conditions and Ecological and Social Context
• A number of marine and coastal areas in NL have been designated as protected under provincial, federal and / or other legislation or agreements due to their biological / ecological or socio-cultural characteristics and importance, and other areas have been formally identified as being special or sensitive through relevant processes and initiatives.
• Special areas designation or identification is often directly related to the existing physical and biological environment, including Marine Fish and Fish Habitat, Marine and Migratory Birds and Marine Mammals and Sea Turtles (including species at risk) or socio-cultural values such as economy, culture, history or recreation, which are also covered in other sections of the EIS.
• A number of these special areas are located on land or in coastal areas and thus outside of the Core BdN Development, Project Area and LSA. Those located within the offshore environment include Canadian Marine Refuges, EBSAs, and Significant Benthic Areas, as well as international UNCBD EBSAs, VMEs, and NAFO FCAs.
• None of the special areas (i.e., a UNCBD EBSA, a NAFO FCA, and a VME) that intersect the Core BdN Development and / or Project Area have associated prohibitions for offshore oil and gas activities.
• Special areas are valued for their biological and ecological characteristics and their importance for human activities such as fishing.
• Special areas in the LSA or zone of influence for Project effects such as light, sound and drill cuttings emissions are identified for Marine Fish and Fish Habitat Marine and Migratory Birds, and Marine Mammals and Sea Turtles.
• Special areas most regularly used by humans for recreation, subsistence, or tourism activities, are in coastal and onshore areas which are approximately 500 km from the Project Area.</td><td colspan="6">Mitigation Measures
• 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 100m^2 with heights greater than 30 cm within 100 m of the discharge location.
• 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.
• Ballast water and hull fouling will be managed in consideration of applicable Canadian and international requirements to reduce the potential spread of invasive species.
• In consideration of the Offshore Waste Treatment Guidelines (OWTG) (NEB et al. 2010) and regulatory discharge limits, for discharges associated with the Project, the use of best treatment practices that are commercially available and economically feasible will be implemented.
• The selection and screening of chemicals to be discharged, will be undertaken in consideration of the Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands (OCSG) (NEB et al. 2009) and Equinor Canada's chemical selection and screening processes.
• Sewage and food waste will be treated in consideration of the OWTG and in accordance with Canadian and international regulatory requirements (e.g., IMO).
• Appropriate procedures will be implemented for the handling, storage, transportation, and onshore disposal of solid and hazardous waste.
• Use of common traffic routes for vessels and helicopters will be used where possible and practicable
• Helicopter flight paths and offshore supply vessel (OSV) transit routes will adhere to the periods of avoidance, and specific set back distances, associated with specific, established migratory bird nesting colonies outlines in the NL Seabird Ecological Reserve Regulations, 2015 and in consideration of federal guidelines in order to reduce disturbance to colonies.
• Low-level aircraft (helicopters) operations will be limited or avoided where it is not required per Transport Canada protocols.
• In consideration of the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2018), mitigation measures applied during the Project's geophysical surveys where air source arrays are used will be consistent with those outlined in the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP) (DFO 2007).
• 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.
• In the unlikely event of a collision with a marine mammal or sea turtle, Equinor Canada will contact DFO.
• Communications and notifications of Project activities, as applicable, with commercial fisheries and other ocean users (see Section 13.1.5.2 for a complete list)
• A decommissioning plan will be developed and submitted to the C-NLOPB for review and acceptance. The plan will be made in consideration of regulatory requirements, engagement with Indigenous groups, commercial fisheries and other stakeholders and likely effects on the environment.
• Use of explosives will not be employed for removal of wellheads.
• At the time of decommissioning a well, the well will be inspected in accordance with applicable regulatory requirements</td></tr>
<tr><th rowspan="2">Project Component or Activity</th><th rowspan="2">Potential Environmental Effects</th><th colspan="7">Residual Environmental Effects Summary Descriptors</th></tr>
<tr><th>Nature</th><th>Magnitude</th><th>Geographic Extent</th><th>Duration</th><th>Frequency</th><th>Reversibility</th><th>Certainty</th></tr>
<tr><td colspan="9">CORE BdN DEVELOPMENT ACTIVITIES</td></tr>
<tr><td colspan="9">OFFSHORE CONSTRUCTION AND INSTALLATION, HOOK-UP AND COMMISSIONING</td></tr>
</table>

Table 12.5 Environmental Effects Assessment Summary: Special Areas – Core BdN Development

ENVIRONMENTAL EFFECTS ASSESSMENT SUMMARY								
Offshore Construction and Installation								
Presence of Vessels								
Lighting	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sound	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Discharges and Air Emissions	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Installation of Subsea Infrastructure (including potential protection)	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L	L	S	R	R	H
Hook-up and Commissioning								
Presence of Vessels								
Lighting	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sound	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Discharges and Air Emissions	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HUC Activities								
Marine Discharges	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PRODUCTION AND MAINTENANCE OPERATIONS								
Presence of FPSO and Subsea Infrastructure								
Lighting	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sound	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Waste Management - Marine Discharges and Emissions								
Produced Water	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other Waste Discharges	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Air Emissions (including flaring)	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DRILLING ACTIVITIES								
Presence of Drilling Installation								
Lighting	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sound	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Waste Management - Marine Discharges and Emissions								
Drill Cuttings	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L	L	M-L	R	R	H
Other Waste Discharges	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Air Emissions (including flaring)	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SUPPLY AND SERVICING								
Marine Vessels								
Presence	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L	LSA	L	R	R	H
Lighting	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L	LSA	L	R	R	H
Sound	• Change in environmental features and / or processes	A	L	LSA	L	R	R	M-H

Table 12.5 Environmental Effects Assessment Summary: Special Areas – Core BdN Development

ENVIRONMENTAL EFFECTS ASSESSMENT SUMMARY								
	• Change in human use and / or societal value							
Aircraft (helicopters)								
Sound	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L	L	L	R	R	H
SUPPORTING SURVEYS								
Geophysical Activities								
Presence of Vessels and Towed Equipment	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L	L	S	S	R	H
Lighting	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sound	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L-M	LSA	S	S	R	M
Environmental, Geotechnical, Geological, ROV / AUV Surveys								
Presence of Vessels	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lighting	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sound	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Contact with Seabed	• Change in environmental features and / or processes • Change in human use and / or societal value	A	N	L	S	S	R	H
DECOMMISSIONING								
Decommissioning of FPSO	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Decommissioning of Subsea Infrastructure	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L	L	S-M	R	R	H
Well Decommissioning	• Change in environmental features and / or processes • Change in human use and / or societal value	A	N	L	S	R	R	H
Evaluation of Significance Oil and gas development activities such as those being proposed for this Project are not prohibited within special areas that intersect the Core BdN Development, Project Area or LSA. For the special areas that do intersect or otherwise interact with planned Project activities and the zones of influence for the Project, the defining features (i.e., physical, biological, and socioeconomic) within these areas will not be adversely changed by the Project. The Project is therefore not likely to result in significant adverse environmental effects on the Special Areas VC. NOTE: The environmental effects assessment for accidental events is presented separately in Chapter 16.								

Table 12.5 Environmental Effects Assessment Summary: Special Areas – Core BdN Development

ENVIRONMENTAL EFFECTS ASSESSMENT SUMMARY		
KEY		
Nature / Direction:	Frequency:	Certainty in Predictions:
P Positive	N Not likely to occur	L Low level of confidence
A Adverse	O Occurs once	M Moderate level of confidence
N Neutral (or no-effect)	S Occurs sporadically	H High level of confidence
	R Occurs on a regular basis	
Magnitude:	C Occurs continuously	N/A Not Applicable
N Negligible		
L Low	Duration:	
M Medium	S Short-term - less than 12 months (1 year)	
H High	M Medium-term - 1 to 5 years	
	L Long-term - more than 5 years	
Geographic Extent:		
L Localized, in immediate vicinity of activity	Reversibility:	
PA Within Project Area	R Reversible (will recover to baseline)	
LSA Within LSA	I Irreversible (permanent)	
RSA Within RSA or beyond		

Table 12.6 Environmental Effects Assessment Summary: Special Areas – Potential Future Development

ENVIRONMENTAL EFFECTS ASSESSMENT SUMMARY	
Summary of Existing Conditions and Ecological and Social Context • A number of marine and coastal areas in NL have been designated as protected under provincial, federal and / or other legislation or agreements due to their biological / ecological or socio-cultural characteristics and importance, and other areas have been formally identified as being special or sensitive through relevant processes and initiatives. • Special areas designation or identification is often directly related to the existing physical and biological environment, including Marine Fish and Fish Habitat, Marine and Migratory Birds and Marine Mammals and Sea Turtles (including species at risk) or socio-cultural values such as economy, culture, history or recreation, which are also covered in other sections of the EIS. • A number of these special areas are located on land or in coastal areas and thus outside of the Core BdN Development, Project Area and LSA. Those located within the offshore environment include Canadian Marine Refuges, EBSAs, and Significant Benthic Areas, as well as international UNCBD EBSAs, VMEs, and NAFO FCAs. • None of the special areas (i.e., a UNCBD EBSA, a NAFO FCA, and a VME) that intersect the Core BdN Development and / or Project Area have associated prohibitions for offshore oil and gas activities. • Special areas are valued for their biological and ecological characteristics and their importance for human activities such as fishing. • Special areas in the LSA or zone of influence for Project effects such as light, sound and drill cuttings emissions are identified for Marine Fish and Fish Habitat, Marine and Migratory Birds, and Marine Mammals and Sea Turtles. • Special areas most regularly used by humans for recreation, subsistence, or tourism activities, are in coastal and onshore areas which are approximately 500 km from the Project Area.	**Mitigation Measures** • 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 100m^2 with heights greater than 30 cm within 100 m of the discharge location. • 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. • Ballast water and hull fouling will be managed in consideration of applicable Canadian and international requirements to reduce the potential spread of invasive species. • In consideration of the Offshore Waste Treatment Guidelines (OWTG) (NEB et al. 2010) and regulatory discharge limits, for discharges associated with the Project, the use of best treatment practices that are commercially available and economically feasible will be implemented. • The selection and screening of chemicals to be discharged, will be undertaken in consideration of the Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands (OCSG) (NEB et al. 2009) and Equinor Canada's chemical selection and screening processes. • Sewage and food waste will be treated in consideration of the OWTG and in accordance with Canadian and international regulatory requirements (e.g., IMO). • Appropriate procedures will be implemented for the handling, storage, transportation, and onshore disposal of solid and hazardous waste. • Use of common traffic routes for vessels and helicopters will be used where possible and practicable • Helicopter flight paths and offshore supply vessel (OSV) transit routes will adhere to the periods of avoidance, and specific set back distances, associated with specific, established migratory bird nesting colonies outlines in the *NL Seabird Ecological Reserve Regulations, 2015* and in consideration of federal guidelines in order to reduce disturbance to colonies. • Low-level aircraft (helicopters) operations will be limited or avoided where it is not required per Transport Canada protocols. • In consideration of the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2018), mitigation measures applied during the Project's geophysical surveys where air source arrays are used will be consistent with those outlined in the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP) (DFO 2007). • 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. • In the unlikely event of a collision with a marine mammal or sea turtle, Equinor Canada will contact DFO. • Communications and notifications of Project activities, as applicable, with commercial fisheries and other ocean users (see Section 13.1.5.2 for a complete list) • A decommissioning plan will be developed and submitted to the C-NLOPB for review and acceptance. The plan will be made in consideration of regulatory requirements, engagement with Indigenous groups, commercial fisheries and other stakeholders and likely effects on the environment. • Use of explosives will not be employed for removal of wellheads. • At the time of decommissioning a well, the well will be inspected in accordance with applicable regulatory requirements.

Project Component or Activity	Potential Environmental Effects	Residual Environmental Effects Summary Descriptors						
		Nature	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Certainty
Offshore Construction and Installation, and Hook-up and Commissioning	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L	PA	S	R	R	H
Production and Maintenance Operations	• No interaction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Drilling Activities	• Change in environmental features and / or processes	A	L	PA	M-L	R	R	H

Table 12.6 Environmental Effects Assessment Summary: Special Areas – Potential Future Development

ENVIRONMENTAL EFFECTS ASSESSMENT SUMMARY								
	• Change in human use and / or societal value							
Supply and Servicing	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L	LSA	L	R	R	M-H
Supporting Surveys	• Change in environmental features and / or processes • Change in human use and / or societal value	A	L-M	LSA	S	S	R	M-H
Decommissioning	• Change in environmental features and / or processes • Change in human use and / or societal value	A	N-L	PA	M	R	R	H

Evaluation of Significance

Oil and gas development activities such as those being proposed for this Project are not prohibited within special areas that intersect the Core BdN Development, Project Area, or LSA. For the special areas that do intersect or otherwise interact with planned Project activities and the zones of influence for the Project, the defining features (i.e., physical, biological, and socioeconomic) within these areas will not likely be adversely changed by the Project. The Project is therefore not likely to result in significant adverse environmental effects on the Special Areas VC.

NOTE: The environmental effects assessment for accidental events is presented separately in Chapter 16.

KEY

Nature / Direction:
- P Positive
- A Adverse
- N Neutral (or no-effect)

Magnitude:
- N Negligible
- L Low
- M Medium
- H High

Geographic Extent:
- L Localized, in immediate vicinity of activity
- PA Within Project Area
- LSA Within LSA
- RSA Within RSA or beyond

Frequency:
- N Not likely to occur
- O Occurs once
- S Occurs sporadically
- R Occurs on a regular basis
- C Occurs continuously

Duration:
- S Short-term - less than 12 months (1 year)
- M Medium-term - 1 to 5 years
- L Long-term - more than 5 years

Reversibility:
- R Reversible (will recover to baseline)
- I Irreversible (permanent)

Certainty in Predictions:
- L Low level of confidence
- M Moderate level of confidence
- H High level of confidence
- N/A Not Applicable

12.5 Environmental Monitoring and Follow-up

The various environmental monitoring and follow-up initiatives outlined earlier in relation to relevant components of the biophysical environment will be indirectly applicable to effects on Special Areas. This includes those that apply to Marine Fish and Fish Habitat, Marine and Migratory Birds, and Marine Mammals and Sea Turtles. The purpose of the follow-up monitoring programs is to determine the effectiveness of mitigation measures in protecting the defining features for which special areas have been identified and Project effects have been anticipated. Refer to Sections 9.5, 10.5, and 11.5 for information on proposed monitoring and follow-up.

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APPENDIX H:

INFORMATION TO SUPPORT RESPONSE TO IR-242/CEHH-110, IR-269/CEHH-106

Table 16.40 Unmitigated Subsurface Blowout Potential Interactions above Ecological Thresholds with Special Areas

Special Area	Reason for Designation	95 Percentile Sea Surface				95 Percentile Water Column				95 Percentile Shoreline/Sediment			
		36 day Site #		115 day Site #		36 day Site #		115 day Site #		36 day Site #		115 day Site #	
		1	2	1	2	1	2	1	2	1	2	1	2
Marine Protected Areas (MPAs) and Areas of Interest (AOI)													
Eastport – Duck Islands MPA	Limits fishing to maintain a viable American lobster population and protect other threatened or endangered species.												
Eastport – Round Island MPA													
Canadian Ecologically and Biologically Significant Areas (EBSAs)													
Orphan Spur	High concentrations of corals. Presence of vulnerable fish species			X	X								
Notre Dame Channel	Cetacean feeding and migration. Several species of seabirds. Wintering harp seals.			X	X								
Fogo Shelf	Seabird breeding colonies. Capelin spawning areas. Important cetacean feeding areas. Marine mammal presence.			X									
Labrador Slope	Diversity of corals, sponges. Presence of vulnerable fish species.			X									
Northeast Slope	High aggregations of vulnerable fish species in spring. Concentrations of cetaceans, pinnipeds and corals.	X	X	X	X								
Virgin Rocks	High aggregations of capelin and other spawning groundfish. Seabird feeding areas.	X	X	X	X								

Lilly Canyon-Carson Canyon	Concentration, reproduction and feeding area for Iceland scallop. Aggregation and refuge/overwintering for cetaceans and pinnipeds.	X	X	X	X				X				
Southeast Shoal	High benthic biomass. Aggregation, feeding, breeding and/or nursery habitats for capelin, groundfish, cetaceans and seabirds.	X	X	X	X								
Eastern Avalon	Seabird feeding areas. Cetaceans, leatherback turtles and seals feed in the area from spring to fall.			X	X					X		X	X
Southwest Slope	Wide variety of seabirds. Pelagic seabird feeding area. Many marine mammals and leatherback sea turtles aggregate in summer.		X	X	X								
Haddock Channel Sponges	***Largest sponge SBA on the shelf in the study area (DFO). Important aggregations of capelin and American plaice.***			X	X								
St. Mary's Bay	***Significant colonies and foraging area for common murre, northern gannet, razorbill and black-legged kittiwake. Aggregations of harlequin duck, salmon, capelin, common eider, Mysticetes functional group, hooded seal, leatherback turtle.***									X	X	X	X
Bonavista Bay	***Significant aggregations of eelgrass, salmon, killer whale, harbour seal, Mysticetes and duck functional groups. Important area for capelin and***			X									

	sea lamprey spawning. Significant foraging area for black-legged kittiwake and tern species.												
Baccalieu Island	***Noted aggregations of killer whales, capelin, shrimp, plankpiscivores, spotted wolfish and seabird functional groups. Capelin spawning area. Important foraging area for Atlantic puffin, black-legged kittiwake and razorbill.***			X	X								X
Marine Refuges													
Northeast Newfoundland Slope Closure	Aggregations of corals. Prohibitions for bottom contact fishing activities.	X	X	X	X	X			X				
Funk Island Deep Closure	Conserves seafloor habitat important to Atlantic cod. Bottom trawl, gillnet and longline fishing are prohibited.			X	X								
Gooseberry Island Lobster Area Closure	***Key lobster spawning habitat. All lobster fishing is prohibited to increase lobster spawning and egg production.***												
3O Coral Closure (portion inside EEZ)	***Large and small gorgonian corals and sea pens. Presence of leatherback sea turtles, redfish and Atlantic cod. All bottom fishing activities prohibited to protect corals and sponges.***	***X***		***X***	***X***								
Newfoundland and Labrador Shelves Bioregion Significant Benthic Areas													
Sea Pens	***Modelling has determined high predicted presence probability of aggregations of sea pens, sponges,***	***X***		***X***	***X***								
Sponges		***X***	***X***	***X***	***X***								
Large Gorgonian Corals		***X***	***X***	***X***	***X***								

Small Gorgonian Corals	***small gorgonian corals and large gorgonian corals.***	***X***	***X***	***X***	***X***								
Canadian Fisheries Closures (FCA) within the EEZ													
Eastport Lobster Management Area	Fishing restrictions to protect prime lobster habitat. Two smaller areas are designated as MPAs under the *Oceans Act*												
Funk Island Deep Box	***Bottom trawl, gillnet and longline fishing activities prohibited to conserve benthic habitat and Atlantic cod habitat.***			X	X								
Gooseberry Island Lobster Area Closure	***Key lobster spawning habitat. All lobster fishing is prohibited to increase lobster spawning and egg production.***												
Snow Crab Stewardship Exclusion Zones													
Crab Fishing Area 5A (2 zones)	Snow crab fishing is prohibited.			X									
Crab Fishing Area 6A (2 zones)				X	X								
Crab Fishing Area 6B				X									
~~Crab Fishing Area 6C~~				~~X~~	~~X~~								
~~Crab Fishing Area 8A~~				~~X~~	~~X~~								
Crab Fishing Area – 8BX		X	X	X	X								
Crab Fishing Area – 9A (2 zones)					X								
Near Shore (2 zones)				X	X								
~~**Preliminary Representative Marine Areas**~~													

~~Virgin Rocks~~	~~Groundfish spawning habitat. Congregation area for capelin and seabirds. Winter colonies of seabirds.~~	~~X~~	~~X~~	~~X~~	~~X~~								
~~South Grand Bank Area~~	~~High coral and fish species richness. Significant groundfish biomass. Feeding area for seabirds, cetaceans and leatherback turtles.~~	~~X~~	~~X~~	~~X~~	~~X~~								
~~Northwestern Conception Bay~~	~~Capelin spawning area. Abundance and diversity of seabird species. Seabird breeding habitat.~~												~~X~~
Coastal Provincial Ecological Reserves													
Witless Bay Seabird Ecological Reserve	Protects seabird breeding colonies. Large numbers of seabirds in area.			X								X	X
Baccalieu Island Seabird Ecological Reserve	Protects seabird breeding colonies. Large numbers and large colonies.												X
Mistaken Point Fossil Ecological Reserve	Protects fossils of oldest complex life forms. Also noted for seabirds.									X	X	X	X
Cape St. Mary's Seabird Ecological Reserve	Protects seabird breeding colonies. Large numbers of seabirds including overwintering waterfowl.											X	X
Coastal Provincial Parks and Protected Areas													
Chance Cove	Day use park. Natural or scenic attraction.									X		X	
Gooseberry Cove	Day use park. Natural or scenic attraction.									X			
UN Convention on Biological Diversity EBSAs													
Seabird Foraging Zone in the Southern Labrador Sea	Abundance of seabirds. Foraging habitat for overwintering and breeding seabirds.	X	X	X	X								
Orphan Knoll	Fragile and long-lived corals and sponges.		X	X	X								

Slopes of the Flemish Cap and Grand Bank	Aggregations of VME indicator species such as corals and sponges. A component of Greenland halibut fishery grounds. High diversity including threatened and listed species.	X	X	X	X	X	X	X	X				
Southeast Shoal and Adjacent Areas on the Tail of the Grand Bank	***Offshore capelin-spawning ground, nursery ground for yellowtail flounder and spawning areas for depleted American plaice, depleted Atlantic cod and striped wolffish. Abundant forage fish. Important feeding area for a number of cetaceans, including humpback and fin whales, frequented by large numbers of seabirds.***	***X***	***X***	***X***	***X***				***X***				
UN FAO Vulnerable Marine Ecosystems (VMEs)													
~~Northeast Shelf and Slope (within Canadian EEZ)~~	~~Abundance of corals.~~	~~X~~	~~X~~	~~X~~	~~X~~				~~X~~				
~~Sackville Spur~~	~~High density of sponges.~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~				
~~Northern Flemish Cap~~	~~High density of sea pens and corals. Presence of vulnerable fish species.~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~				
~~Southern Flemish Pass to Eastern Canyons~~	~~Large corals and high density of sponges. Presence of vulnerable fish species.~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~				
~~Beothuk Knoll~~	~~Abundant corals and high density of sponges. Presence of vulnerable fish species.~~	~~X~~	~~X~~	~~X~~	~~X~~				~~X~~				
~~Deep Water Coral Area~~	~~Deep-water coral VMEs are considered likely.~~	~~X~~	~~X~~	~~X~~	~~X~~			~~X~~	~~X~~				

~~Flemish Cap East~~	~~Large corals and high density of sponges. Vulnerable fish species: black dogfish and smooth skate.~~	~~X~~	~~X~~	~~X~~	~~X~~			~~X~~	~~X~~				
~~South East Shoal and Adjacent Shelf Edge / Canyons~~	~~Fish spawning grounds and marine mammal feeding area. Long-lived and relict bivalve populations in sandy shoal habitat.~~	~~X~~	~~X~~	~~X~~	~~X~~								
~~Division 3O Coral Closure~~	~~Concentrations coral and sea pens. Presence of vulnerable fish species.~~	~~X~~	~~X~~	~~X~~	~~X~~								
Sponge	***Identified for sponges, sea pens and large gorgonian corals.***	***X***	***X***	***X***	***X***	***X***	***X***	***X***	***X***				
Sea Pen		***X***	***X***	***X***	***X***	***X***	***X***	***X***	***X***			***X***	
Large Gorgonian Coral		***X***	***X***	***X***	***X***	***X***	***X***	***X***	***X***				***X***
NAFO Fisheries Closure Areas (FCAs)													
Tail of the Bank (1)	Closed to bottom fishing to protect concentrations of corals, sponges and seapens and/or seamounts.	X	X	X	X								
Flemish Pass/Eastern Canyon (2)		X	X	X	X	X	X	X	X				
Beothuk Knoll (3)		X	X	X	X				X				
Eastern Flemish Cap (4)		X	X	X	X			X	X				
Northeast Flemish Cap (5)		X	X	X	X			X	X				
Sackville Spur (6)		X	X	X	X	X	X	X					
Northern Flemish Cap (7)		X	X	X	X	X		X	X				
Northern Flemish Cap (8)		X	X	X	X	X		X	X				
Northern Flemish Cap (9)		X	X	X	X	X		X	X				
Northwest Flemish Cap (10)		X	X	X	X	X	X	X	X				
Northwest Flemish Cap (11)		X	X	X	X	X	X	X	X				
Northwest Flemish Cap (12)		X	X	X	X	X	X	X	X				
Beothuk Knoll (13)		X	X	X	X				X				
~~Eastern Flemish Cap (14)~~		~~X~~	~~X~~	~~X~~	~~X~~			~~X~~					
Orphan Knoll Seamount			X	X	X								
Newfoundland Seamounts		X	X	X	X								

Fogo Seamounts (1)				X	X								
30 Coral Area Closure		X	X										
Important Bird Areas (IBAs)													
Quidi Vidi Lake	Wintering area for seagulls and waterfowl. The IBA includes coastal areas.			X								X	X
Witless Bay Islands	Seabird breeding area. Waterfowl migration area.			X								X	X
Cape St. Francis	Wintering area for waterfowl. Presence of shorebirds in winter.												X
Baccalieu Island	Abundance and high diversity of seabirds including breeding colonies.												X
Grates Point	Wintering waterfowl and seabirds. Seabirds present in summer months.												X
Mistaken Point	Wintering area for waterfowl. Overwintering shorebirds. Nesting seabirds.				X					X			X
The Cape Pine and St. Shotts Barren	Migration area for shorebirds.									X		X	X
Placentia Bay	Summer seabird feeding area. Large numbers of breeding seabirds. Large numbers of seabirds and wintering waterfowl.									X			
Cape Freels Coastline and Cabot Island	Wintering waterfowl. Nesting seabirds.			X									
Cape St. Mary's	Significant numbers of breeding seabird populations. Large numbers of migrating waterfowl in winter, including species of Special Concern.									X		X	X

Wadham Islands and adjacent Marine Area	Wintering waterfowl. Nesting seabirds.			X									
UNESCO World Heritage Sites (WHSs)													
Mistaken Point Ecological Reserve	Protects fossil deposits.									X		X	
North East Atlantic Fisheries Commission (NEAFC) FCAs													
Middle Mid-Atlantic Ridge	Closed to bottom fishing to protect seamounts and fractures highly likely to contain VME indicator species such as corals and sponges.	X	X	X	X								
Note: X indicates special area intersects with area above ecological threshold													

APPENDIX I:

INFORMATION TO SUPPORT RESPONSE TO IR-275/ECCC-44

Elisabeth DeBlois

Environmental Consulting

Elisabeth DeBlois Inc.

Address: 456 Marine Drive,
Logy Bay, NL
Canada, AIK 3E1
Telephone: 709 754 5470
Fax: 709 754 4281

Business No.: 55776

TITLE

DREAM Model for Produced Water Release at the Bay du Nord Development

AUTHOR(S)

Elisabeth DeBlois

CLIENT(S)

WOOD Environment & Infrastructure Solutions

REPORT NO.	CLASSIFICATION	CLIENTS REF.	
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ABSTRACT

Six scenarios for produced water release were simulated. A produced water release rate of 30,000 m^3/day was used for the first four cases; a release rate of 50,000 m^3/day was used for the fifth and sixth cases. For the 30,000 m^3/day scenarios, chemical profiles at OIW concentrations of 15 and 30 ppm were examined (Case 1 and Case 2, respectively). It was then assumed that produced water would be mixed with cooling water, which would result in dilution of the 15 and 30 ppm chemical profiles (Case 3 and Case 4, respectively). The remaining two scenarios examined the effect of increased produced water discharge to 50,000 m^3/day at 30 ppm OIW concentrations, without mixing with cooling water (Case 5) and with mixing with cooling water (Case 6).

Case 5, representing the case with the largest produced water discharge volume, the highest OIW concentrations and no mixing with cooling water, was selected for detailed examination. Concentrations of OIW, some BTEX and 2-3 ring PAHs, and phenol (incl. C1-C3 alkyl phenols) occurred at concentrations above their no-effects concentration. For all of these, concentrations for Case 5 were highest within 100 m of discharge source, and higher concentrations were more common to the southeast and within the top 10 m of the water column. Within 100 m from discharge source, concentrations could exceed no-effects concentrations up to 40% of the time for OIW and up to 60% of the time for BTEX, 2-3 ring PAHs and phenol. All concentrations decreased with distance. From 100 to 400 m of discharge source, OIW concentrations could exceed no-effects concentrations 10 to 20% of the time; and from 400 m to 1 km, concentrations could exceed no-effects concentrations 5 to 10% of the time. For BTEX, 2-3 ring PAHs and phenol, concentrations could exceed no-effects concentrations 20 to 30% of the time from 100 to 400 m, 10 to 20% of the time from 400 m to 1 km, and 5 to 10% of the time from 1 to 2 km.

Case 5 represents the worst case scenario of the six cases. Therefore, estimates of the potential zone of influence of produced water constituents presented above can be regarded as conservative~~. Through the remaining cases tested, this exercise has shown that a lower daily produced water volume, lower OIW concentrations and, to a lesser extent, mixing with cooling water would each decrease environmental risk~~.

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1 Introduction

The purpose of this report is to examine the distribution of oil-in-water (OIW) and other constituents of the produced water discharge at the proposed Bay du Nord Development Project site using the Dose-Related Risk and Effects Assessment Model (DREAM) (see Appendix A for details on DREAM). DREAM was developed by SINTEF in Trondheim, Norway, and is readily used in Norway and internationally to assess the distribution of produced water. The model can be used to examine the distribution of individual constituents within a produced water plume by taking into account their physical properties. Relevant properties incorporated in simulations include: concentration on release, density, solubility, vapour pressure, degradation rate and oil to water partitioning coefficient.

Constituents examined in this report are those identified as relevant in OSPAR (2012). Special attention is given to OIW, but results are also presented for other constituents (see Section 2 for a full list of constituents examined). In all cases, constituent concentrations in the water column are compared to predicted no-effects concentrations (PNEC values) as provided in OSPAR (2014) to provide a spatial and temporal estimate of concentrations that exceeded no-effects concentrations (i.e., concentrations that might lead to an effect). OSPAR (2014) predicted no-effects concentrations are based on long-term laboratory toxicity tests, usually at three trophic levels (algae, zooplankton and fish). As such, they are general and can be used as a first gauge of potential effects.

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, in keeping with the worst-case scenario approach. Results of continuous discharge over 30 days in June are provided herein.

2 Bay du Nord Produced Water Release Scenarios

The release site for simulations was located at 46° 23' 0.887" W and 47° 57' 49.647" N within the core Bay du Nord Development Project Area (Figure 2.1).

Six modeling exercises were performed. The first four modelling exercises were performed at a discharge rate of 30,000 m^3/day, with and without mixing with cooling water and OIW concentrations of either 15 ppm or 30 ppm. The 30 ppm scenarios represent the monthly target level for treated produced water discharge per the Offshore Waste Treatment Guidelines (National Energy Board et al. 2010). With the application of best available technology and optimal processing conditions, OIW concentrations may be reduced lower than the guideline level. The last two modelling exercises were performed at a discharge rate of 50,000 m^3/day, with and without mixing with cooling water and at 30 ppm OIW concentrations. The 50,000 m^3/day scenarios represent the maximum anticipated produced water discharge rate for the Bay du Nord Development Project. A summary of simulated scenarios is provided in Table 2-1.

Chemical profiles for the naturally occurring constituents in produced water represented at OIW concentrations of 15 and 30 ppm are provided in Table 2-2, as are PNEC values (after OSPAR 2014). Because information on produced water at Bay du Nord will not be available until produced water is released, chemical profiles are standard average profiles used by Equinor for new developments based on values observed at their existing developments.

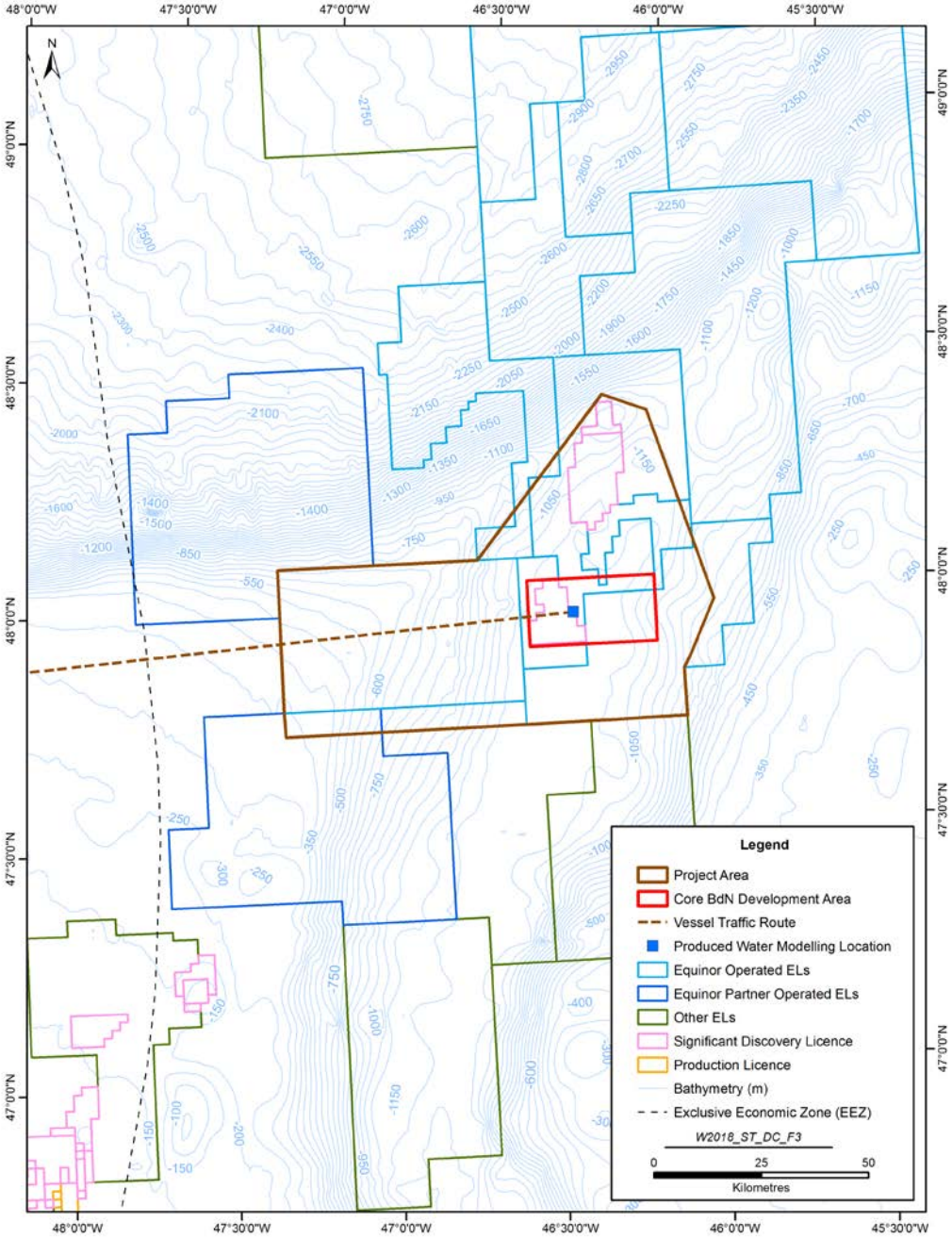

Figure 2-1 Bay du Nord Development Project Area and Produced Water Release Site Location

BdN = Bay du Nord
EL = Exploration License

Table 2-1 Produced water release scenarios at Bay du Nord.

Variable	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6
PW Flow (m^3/day)	30,000	30,000	30,000	30,000	50,000	50,000
Cooling Water Flow (m^3/day)	0	0	25,000	25,000	0	25,000
Total Flow of Release (m^3/day)	30,000	30,000	55,000	55,000	50,000	75,000
PW OIW (ppm)	15	30	15	30	30	30
Depth of Release (m below sea surface)	20	20	20	20	20	20
Release Pipe Diameter	0.6 m	0.6 m	0.6 m	0.6 m	0.6 m	0.6 m
Vertical Angle of Release	180°	180°	180°	180°	180°	180°
Temperature of Total Flow (°C)	40	40	37.7	37.7	40	40
Salinity of Total Flow (ppt)	33	33	33	33	33	33

Notes: - PW = Produced water.
- Estimates were provided by Equinor.
- 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.
- A 180° vertical angle of release is a downward release pipe.

Table 2-2 Chemical profiles of naturally occurring constituents in produced water for simulations.

Constituent Group	Constituent	Discharge Concentration (mg/L)	Discharge Concentration (mg/L)	PNEC values (µg/L)
OIW	OIW	**15**	**30**	**70.5**
BTEX	Benzene (and xylene)	8.40045	8.4004	**8**
	Toluene	5.08233	5.0823	**7.4**
	Ethylbenzene	0.31611	0.3161	**10**
Naphtalenes	Napthalene (and alkyl homologues)	0.92623	1.27820	**2**
2-3 ring PAH	Acenaphtylene	0.00111	0.00156	**0.13**
	Acenaphthene	0.00317	0.00448	**0.38**
	Fluorene	0.01227	0.01730	**0.25**
	Phenanthrene (and alkyl homologues)	0.08422	0.11875	**1.3**
	Anthracene (+dibenzothiophene and alkyl homologues)	0.03381	0.04767	**0.1**
4 ring PAH	Fluoranthene	0.00034	0.00051	**0.0063**
	Pyrene	0.00055	0.00081	**0.023**
	Chrysene	0.00990	0.00148	**0.007**
	Benz(a)anthracene	0.00018	0.00027	**0.0012**
5-6 ring PAH	Benzo[b]fluoranthene	0.00009	0.00014	**0.00017**
	Benzo[k]fluoranthene	0.00010	0.00014	
	Benzo(a)pyrene	0.00010	0.00015	
	Indeno[1,2,3-cd]pyrene	0.00001	0.00002	
	Benzo(g,h,i)perylene	0.00004	0.00006	
	Dibenzo(a,h)anthracene	0.00001	0.00002	**0.00014**
Alkyl phenols	Phenol (and C1-C3 alkyl phenols)	6.03395	6.03395	**7.7**
	Butylphenol (and other C4 alkyl phenols)	0.06160	0.06160	**0.64**
	Penthylphenol (and other C5 alkyl phenols)	0.02359	0.02359	**0.2**
	Octylphenol (and C6-C8 alkyl phenols)	0.00117	0.00168	**0.01**
	Nonylphenol (and other C9 alkyl phenols)	0.00006	0.00008	**0.3**
Metals	Cadmium (Cd)	0.000013	0.000013	**0.21**
	Zinc (Zn)	0.003583	0.003583	**3.4**
	Copper (Cu)	0.001048	0.001048	**2.6**
	Lead (Pb)	0.000082	0.000082	**1.3**
	Nickel (Ni)	0.000617	0.000761	**8.6**
	Mercury (Hg)	0.000004	0.000004	**0.048**
	Arsenic (As)	0.000068	0.000068	**0.6**
	Chromium (Cr)	0.000438	0.000438	**0.6**

Notes: - Discharge concentrations were provided by Equinor.
- PNEC values are from OSPAR (2012, 2014).
- BTEX = Benzene, toluene, ethylbenzene and xylene.
- PAH = Polycyclic aromatic hydrocarbons.

3 Met-Ocean Inputs

Met-Ocean inputs were assembled by Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood).

Among the other characteristics of DREAM that may differ from previously submitted produced water modelling exercises, is the use of a current time-series rather than average, high or low current values at a range of depths (i.e., DREAM is dynamic rather than static; current variations within the course of the simulated month are accounted for).

For produced water modelling, the best available current speed and direction time-series measurements for the Bay du Nord Development Project Area were from a current mooring equipped with Acoustic ADCP[1] and RCM[2] instruments deployed from July 2014 to May 2016[3,4]. Current data for June 2015 were selected to be representative of current conditions for June. Current measurements from 21 depths ranging from 25 to 531 m were used. 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 larger closer to the surface than at 25 m (see Appendix B for details). Since larger 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.

Water mass characteristics (temperature and salinity) for June were based on monthly statistics derived from the hydrographic database of the Ocean Data Inventory of the Bedford Institute of Oceanography.

Further details on currents, temperature and salinity data are provided in Appendix B.

4 Model Parameters

The plume was modelled over an area of 20 x 20 km, by 100 m (depth). A deeper modelling window was not required because the plume did not extend beyond 100 m. Cell size was 100 x 100 m, by 10 m (depth). Cell size determines the spatial resolution of the model. Time-step was set at 5 minutes with an output interval every 6 hours.

5 Model Output

Model output was used to generate maps of the total concentration of constitutents in Table 2-2 over the entire modelled area. These maps are a snapshot in time over 30 days of a continuous discharge. They are meant to provide examples of the general behaviour/distribution of the plume on the selected days. Case 5, representing the plume with the largest produced water discharge volume, the highest OIW concentrations and no mixing with cooling water was selected for display in the main body of the report, with snapshot maps for all cases provided in Appendix C. These large

[1] Acoustic Doppler Current Profiler.

[2] Recording Current Meter.

[3] It has been noted previously that use of a single point time series rather than a 3-dimensional representation of the current field removes additional dilution by horizontal and vertical shears, likely contributing to an increase in concentrations (Mark Reed, pers. comm.).

[4] These input currents for the model provide variability in the vertical with horizontal currents assumed to be uniform. The vertical and horizontal current shears likely to be encountered would provide additional dilution to the produced water plume. In this way the concentration predictions presented here may be somewhat conservative (high) (John McClintock, pers. comm.).

scale snapshots were also generated for OIW concentrations, with all cases presented in Appendix D.

Model output was then used to generate probability maps for each constituent listed in Table 2-2. Case 5 was again selected for detailed display with maps for all cases in Appendix E. This second set of maps express the probability that each constituent will exceed no-effects thresholds (OSPAR PNEC values), as listed in Table 2-2[5]. The probability that a constituent will exceed threshold , expressed as a percentage, is equivalent to a percent (%) occurrence over the course of the 30-days simulation period. Maps were also generated for the groups: BTEX, 2-3 ring PAHs and 4-6 ring PAHs, for practical reasons. These groups represent compounds of concern within produced water and with similar physico-chemical and toxicological properties (OSPAR 2014, OSPAR 2012, Neff et al. 2011). For these groups, the no-effects threshold was calculated as a weighted average of the predicted no-effects thresholds (OSPAR PNECs) of constituents in each group[6].

Because this generated a large number of maps even just for Case 5, a subset of these maps was selected for presentation in the main report, with all maps provided in Appendix E. In general, maps of constituents, or constituent groups, that indicated that that no-effects threshold could be exceeded were presented in the main body of this report. Finally, for those selected constituent or constituent groups, maps of maximum concentrations were generated. These last maps express maximum concentrations over the entire water column at the time when the plume was most concentrated (i.e., concentrations were highest). For Case 5, the worst of the six cases and the one highlighted below, maximum concentrations occurred on day 3, at 06:00 hrs.

6 Simulation Results

6.1 General distribution of the PW plume

The produced water plume most often extended to the southeast or south (Figures 6-1 to 6-6). It was generally restricted to the upper 50 m of the water column, with higher concentrations in the first 10 m near discharge source. Case 5, representing the plume with the largest produced water discharge volume, the highest OIW concentrations and no mixing with cooling water was selected for further display of the evolution of the plume. Days 5, 10, 15, 20, 25 and 30 at different depths are shown in Figures 6-1 to 6-6, respectively. These figures represent a snapshot in time over 30 days of a continuous discharge. They are meant to provide examples of the general behaviour/distribution of the plume on the selected days. On day 5, for instance, currents were predominantly to the south; whereas on day 25, currents were predominantly to the southeast. The total plume for remaining

[5] Probability over threshold for any given cell is calculated as the number of model outputs above a threshold in that cell over the total number of outputs in a 30-day simulation X 100.

[6] Weighted PNECs for BTEX, 2-3 ring PAHs and 4-6 ring PAHS were 8.82 µg/L, 1.86 µg/Land 0.0091 µg/L, respectively. A weighted arithmetic average is similar to an ordinary arithmatic average except that instead of each of the data points contributing equally to the final average, some data points contribute more than others. In this case, PNECs were 'weighted' by the relative concentration of each constituent within the group, giving a higher weight to the PNEC values for constituents that occurred at higher concentrations. For instance, within the BTEX group, benzene had the highest concentration (8.4 mg/L) and the total concentration of BTEX was 13.8 mg/L. The weight for BTEX is then 8.4/13.8 = 0.61. This weight is then applied to the PNEC value of 8 µg/L which gives a weighted PNEC value of 4.88 µg/L. The sum of these weighted values for each constituent within the group is then the weighted PNEC value for the group. Because concentrations of some constituents differed slighted between the 15 ppm and the 30 ppm OIW chemical profiles, this generated slightly different weighted PNEC values for each of the two chemical profiles provided in Table 2-2. The average of these two values was used as the threshold for the groups.

cases behaved as did the plume for Case 5. Day 10, 20 and 30 at different depths for all six cases are provided in Appendix C.

OIW concentrations for Cases 1 to 6 on days 10, 20 and 30 at different depths are provided in Appendix D. At this scale, there is no marked difference between the distribution of OIW and the distribution of the total plume (as shown in Figures 6-1 to 6-6); nor are there marked differences among the six cases. As was the case for the total plume, concentrations were highest in the first 10 m of the water column, near discharge source. More detail on the spatial distribution of OIW with respect to no-effects threshold concentrations are provided in Section 6.2.1.

6.2 Near-field concentrations and probability of exceedance of toxicity thresholds

Remaining figures in this report focus on the near-field where concentrations may exceed no-effects threshold concentrations. Depth integrated probability maps and near-field maximum concentrations for OIW, BTEX, 2-3 ring PAHs and phenol (including C1-C3 alkyl phenols) are shown in Figure 6-7 to 6-10. Whereas the figures discussed in Section 6.1 represented snap-shots in time, probability maps (panel A in Figures 6-7 to 6-10) integrate results over the entire simulation window (30 days) and indicate the probability that produced water constituents will occur over the thresholds listed in Table 2-2. Maximum concentration maps (panel B in Figures 6-7 to 6-10) are snap-shots in time on the day and time when the plume was most concentrated.

As was done for snap-shots of the entire plume in Figures 6-1 to 6-6, Case 5 is selected for display below. Probability maps for all cases are provided in Appendix E. A general comparison among the six cases is provided in Section 6.2.6.

6.2.1 Oil-in-Water

The probability that OIW concentrations will exceed the threshold concentration (PNEC) of 70.5 µg/L for Case 5 is provided in Figure 6-7. At maximum discharge rate (50,000 m^3/day), maximum OIW concentration (30 ppm) and no mixing with cooling water, OIW concentrations within 100 m from discharge source could exceed threshold up to 40% of the time. From approximately 100 to 400 m, concentrations could exceed threshold 10 to 20% of the time; and from 400 m to 1 km, concentrations could exceed threshold 5 to 10 % of the time[7]. Higher concentrations occurred to the southeast of discharge source and most concentrations over threshold occurred in the top 10 m of the water column (see Appendix F for depth profiles for Case 5).

6.2.2 BTEX

The probability that concentrations will exceed threshold was higher for BTEX (Figure 6-8). Benzene and xylene accounted for most of this, toluene accounted for less, and ethylbenzene concentrations alone did not exceed threshold concentrations (see Appendix E for probability maps for benzene and xylene, toluene and ethylbenzene). Within 100 m from discharge source, BTEX concentrations could exceed the threshold of 7.83 µg/L up to 60% of the time. Probabilities were in the 20 to 30% range from approximately 100 to 400 m from source; in the 10 to 20% range from approximately 400 m to 1 km; and in the 5 to 10% range from approximately 1 to 2 km. Higher concentrations occurred to the southeast and most concentrations over threshold occurred in the top 10 m of the water column (see Appendix F for depth profiles for Case 5).

[7] These estimates of potential exposure represent episodic events over the course of the month. An estimate of 10%, for example, represents exposure for a total of three days over the month. However, this exposure is not continuous over those three days.

6.2.3 2-3 ring PAHs

For 2-3 ring PAHs, concentrations over the threshold of 1.86 µg/L could occur up to 60% of the time within 100 m from discharge source (Figure 6-9). Probabilities were in the 20 to 30 % range from approximately 100 to 400 m from source; in the 10 to 20% range from 400 m to 1 km; and in the 5 to 10% range from approximately 1 to 2 km. Higher concentrations occurred to the southeast and most concentrations over threshold occurred in the top 10 m of the water column (see Appendix F for depth profiles for Case 5). For this group, naphthalene and anthracene contributed to most to these results. The probability of occurrence for phenanthrene was extremely low, with a predicted occurrence of up to 5% at some locations within 1 km from source. Remaining PAHs within this group (acenapthylene, acenapthene and fluorene) did not occur at concentrations over threshold (see Appendix E for probability maps for all constituents).

6.2.4 Phenol (and C1-C3 alkyl phenols)

For phenols, concentrations exceeding the threshold of 7.7 µg/L could occur up to 60% of the time within 100 m from discharge source (Figure 6-10). Probabilities were in the 20 to 30 % range from approximately 100 to 400 m from source; in the 10 to 20% range from approximately 400 m to 1 km; and in the 5 to 10% range from approximately 1 to 2 km. Higher concentrations occurred to the southeast and most concentrations over threshold occurred in the top 10 m of the water column (see Appendix F for depth profiles for Case 5).

6.2.5 Remaining PW constituents

Of remaining constituents in Table 2-2, only butylphenol (and other C4 alkyl phenols) concentrations exceeded its threshold concentration. The concentration of butylphenol (and other C4 alkyl phenols) could exceet threshold concentrations up to 5% of the time at some locations within approximately 1 km from discharge source. All 4 ring and 5-6 ring PAHs, C5, C6-C8 and C9 alkylphenols and all metals did not exceed their respective threshold concentrations (Appendix E).

6.2.6 Release scenario comparison

Probability of occurrence above no-effects thresholds for OIW for all six cases is provided in Figure 6-11. At 15 ppm OIW concentration (Cases 1 and 3), the footprint of oil concentrations above threshold in the water column was less than half that of Cases 2 and 4 (each at 30 ppm and comparable discharge volumes). As expected, comparison of these cases indicates that a decrease in OIW content in produced water will lead to a decrease in the footprint of oil concentrations over threshold.

Cases 5 and 6 relative to Cases 2 and 4, respectively, assess the influence of increased produced water discharge volume to 50,000 m^3/day. Increased produced water discharge volume increases the footprint of oil concentrations over threshold.

Cases 3, 4 and 6 relative to Cases 1, 2 and 5, respectively, assess the influence of mixing the produced water discharge with cooling water - effectively diluting the produced water discharge. In general, mixing with cooling water reduces the footprint of OIW concentrations over threshold, with this reduction most apparent for Cases 1 versus 3 (Figure 6-11). However, the difference is not as apparent for Cases 2 versus 4, or Cases 5 versus 6. In these instances, it is probable that the higher plume volume caused produced water to expand over a larger area and, with an initial OIW concentration of 30 ppm, many model cells remained above threshold. These results will vary for each constituent depending on their initial concentrations and respective thresholds and constituents 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.

6.3 Summary and discussion

Six scenarios for produced water release at the proposed Bay du Nord development were simulated. A produced water release rate of 30,000 m^3/day was assumed for the first four cases; a release rate of 50,000 m^3/day was assumed for the fifth and sixth cases. For the 30,000 m^3/day scenarios, chemical profiles at OIW concentrations of 15 and 30 ppm were examined (Case 1 and Case 2, respectively). It was then assumed that produced water would be mixed with cooling water, which would result in dilution of the 15 and 30 ppm chemical profiles (Case 3 and Case 4, respectively). The remaining two scenarios examined the effect of increased produced water discharge to 50,000 m^3/day at 30 ppm OIW, without mixing with cooling water (Case 5) and with mixing with cooling water (Case 6).

The general behaviour of the plume was similar for all six cases. The plume most often extended to the southeast or south and was generally restricted to the upper 50 m of the water column, with higher concentrations in the first 10 m near discharge source.

The near-field distribution of produced water constituents was examined for all cases; and maps of the probability of occurrence above no-effects thresholds were generated. Case 5, with the highest discharge volume, the higher OIW concentration and no mixing with cooling water was selected for detailed examination.

Of constituents examined, OIW, some BTEX and 2-3 ring PAHs, and phenol (including C1-C3 alkyl phenols) had the higher probability of occurrence over no-effects thresholds. For all these constituents, higher concentrations occurred to the southeast of discharge source and in the top 10 m of the water column. Remaining constituents had zero or near-zero probability of occurrence over no-effects thresholds.

Results for Case 5 indicated that OIW concentrations could exceed the no-effects threshold of 70.5 µg/L up to 40% of the time within 100 m from discharge source. From approximately 100 to 400 m, concentrations could exceed threshold 10 to 20% of the time; and from 400 m to 1 km, concentrations could exceed threshold 5 to 10 % of the time.

Case 5 results for BTEX, 2-3 ring PAHs and phenol were generally similar. Concentrations of each of these could exceed no-effects thresholds up to 60% of the time within 100 m from discharge source. As was the case for OIW, probability of occurrence over thresholds decreased with distance from discharge source, with probability of occurrence over threshold in the 20 to 30% range from 100 to 400 m, in 10 to 20% range from 400 m to 1 km, and in the 5 to 10% range from 1 to 2 km. Benzene and xylene accounted for most of the results for BTEX, toluene accounted for less, and ethylbenzene concentrations alone did not exceed threshold concentrations. For 2-3 ring PAHs, naphthalene and anthracene accounted for most of the results. The probability of occurrence for phenanthrene was extremely low, with a predicted occurrence of up to 5% of the time at some locations within 1 km from source. Remaining PAHs within this group (acenapthylene, acenapthene and fluorene) did not occur at concentrations over threshold.

As noted above, Case 5 was selected for a more detailed examination because the case had the highest discharge rate, the highest OIW concentration (and associated chemical profile) and no mixing with cooling water. Case 5 was the worst of the six cases tested and estimates of the potential zone of influence of produced water constituents discussed here can be regarded as conservative. ~~Through the remaining cases tested, this exercise has shown that a lower daily produced water volume, lower OIW concentrations and, to a lesser extent, mixing with cooling water would each decrease environmental risk~~.

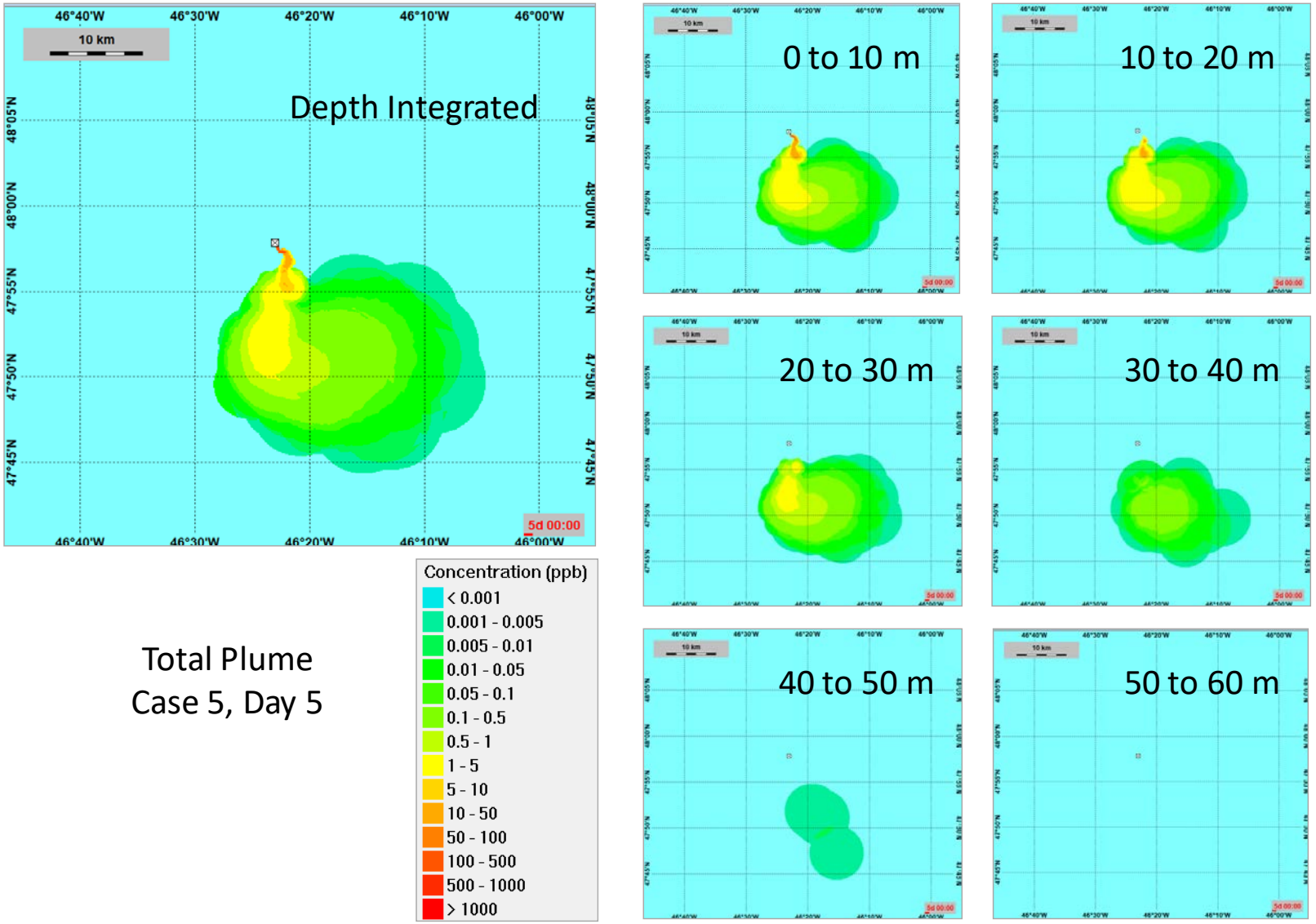

Figure 6-1 Case 5: Distribution of the PW plume on day 5 over the entire water column and at different depths.

This figure represents a snapshot in time over 30 days of continuous discharge. Concentration is total concentration of all constituents in the plume.

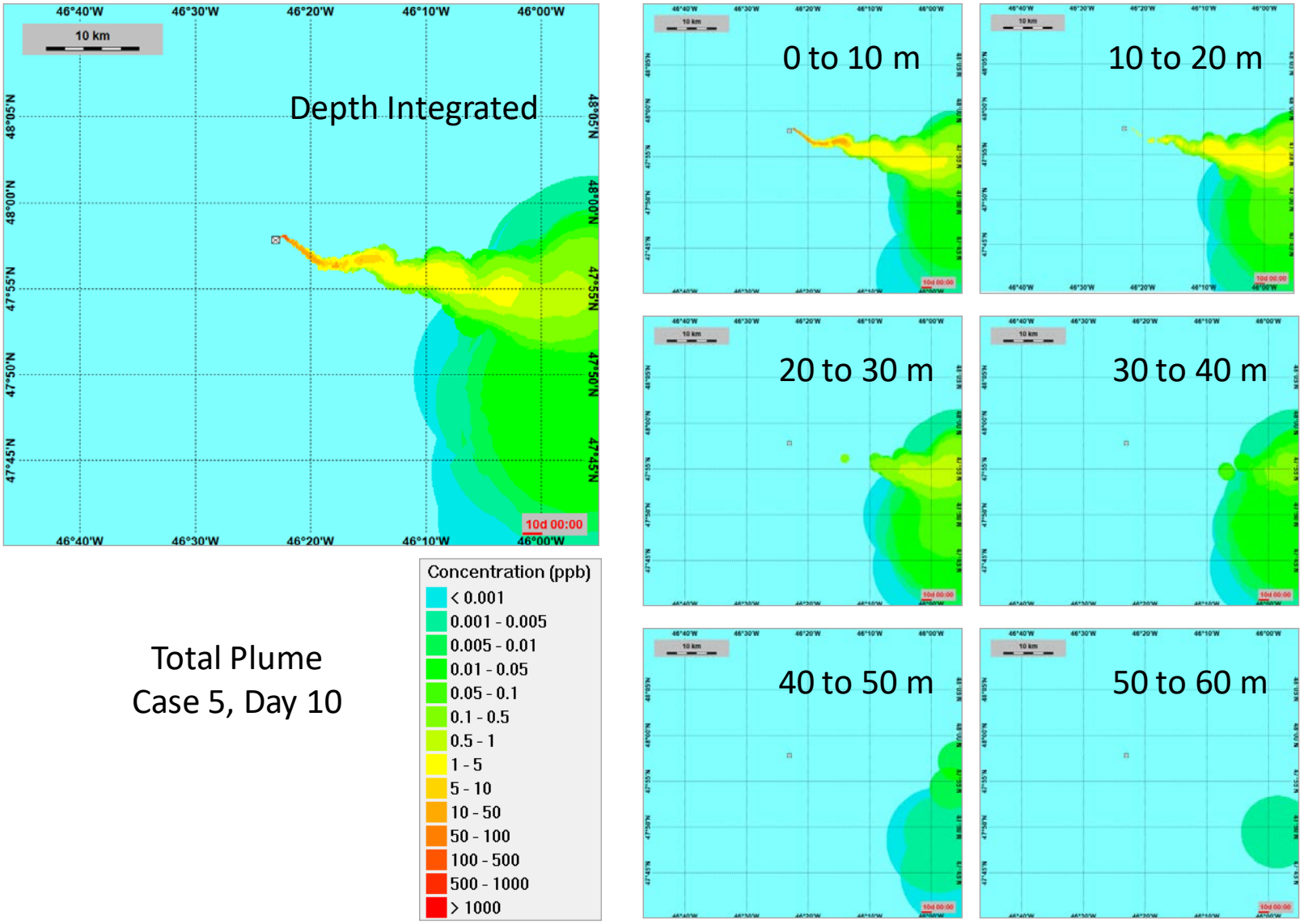

Figure 6-2 Case 5: Distribution of the PW plume on day 10 over the entire water column and at different depths.

This figure represents a snapshot in time over 30 days of continuous discharge. Concentration is total concentration of all constituents in the plume.

Low concentration 'bubbles' in the far field here and elsewhere are caused by single numeric particles with very low mass and should be considered noise (Ute Brönner, pers. comm.)

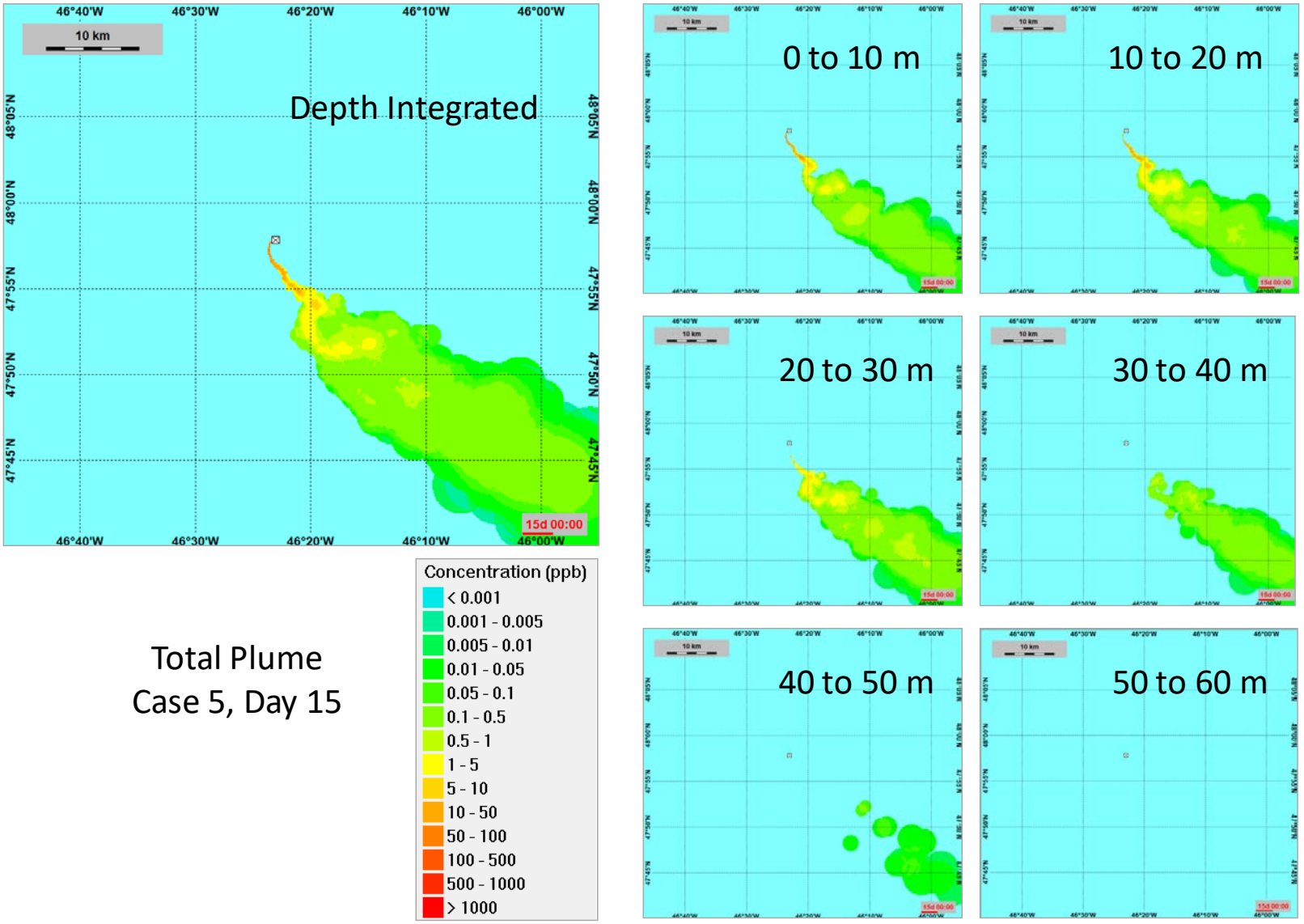

Figure 6-3 Case 5: Distribution of the PW plume on day 15 over the entire water column and at different depths.

This figure represents a snapshot in time over 30 days of continuous discharge. Concentration is total concentration of all constituents in the plume.

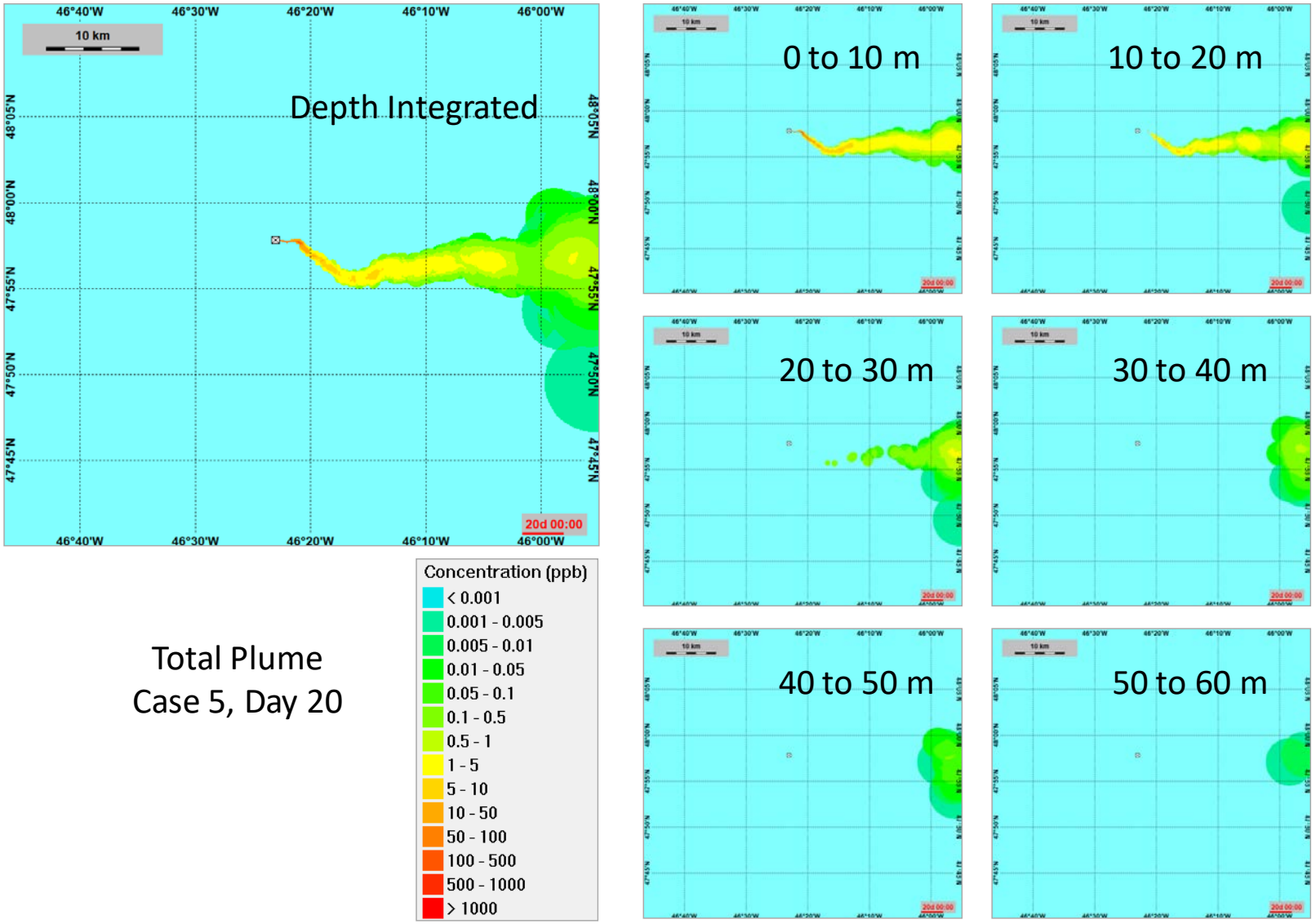

Figure 6-4 Case 5: Distribution of the PW plume on day 20 over the entire water column and at different depths.

This figure represents a snapshot in time over 30 days of continuous discharge. Concentration is total concentration of all constituents in the plume.

Low concentration 'bubbles' in the far field here and elsewhere are caused by single numeric particles with very low mass and should be considered noise (Ute Brönner, pers. comm.)

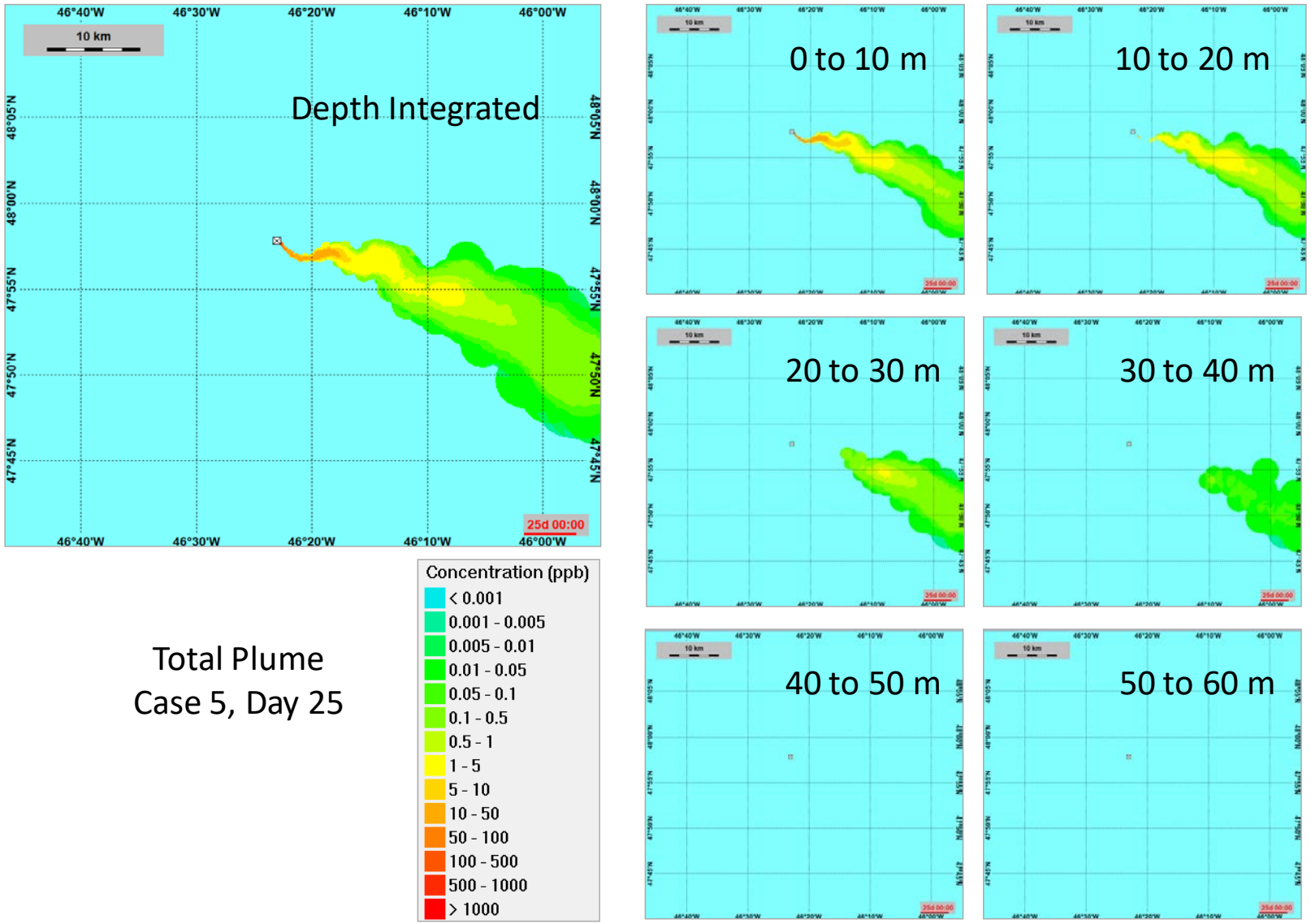

Figure 6-5 Case 5: Distribution of the PW plume on day 25 over the entire water column and at different depths.

This figure represents a snapshot in time over 30 days of continuous discharge. Concentration is total concentration of all constituents in the plume.

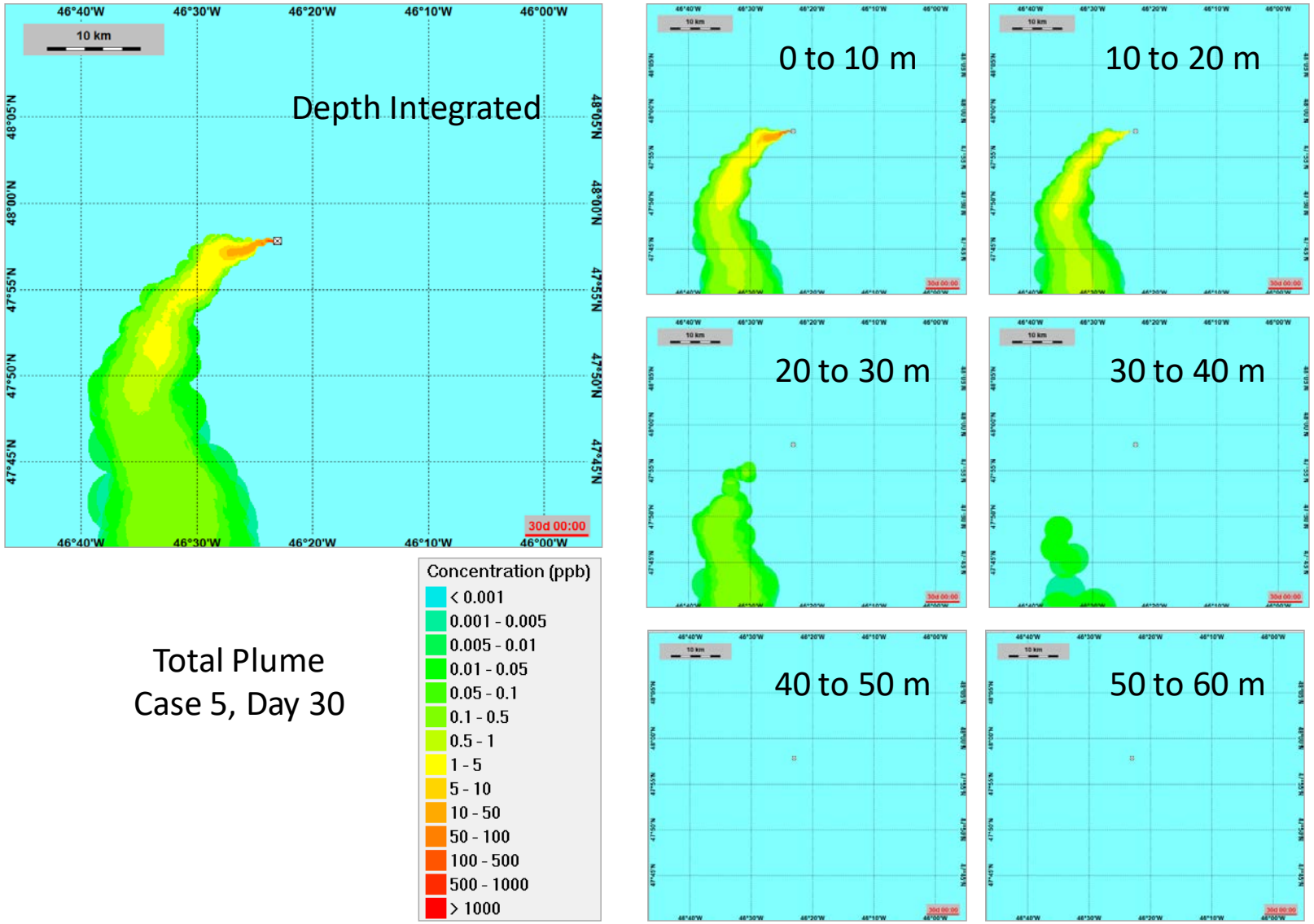

Figure 6-6 Case 5: Distribution of the PW plume on day 30 over the entire water column and at different depths.

This figure represents a snapshot in time over 30 days of continuous discharge. Concentration is total concentration of all constituents in the plume.

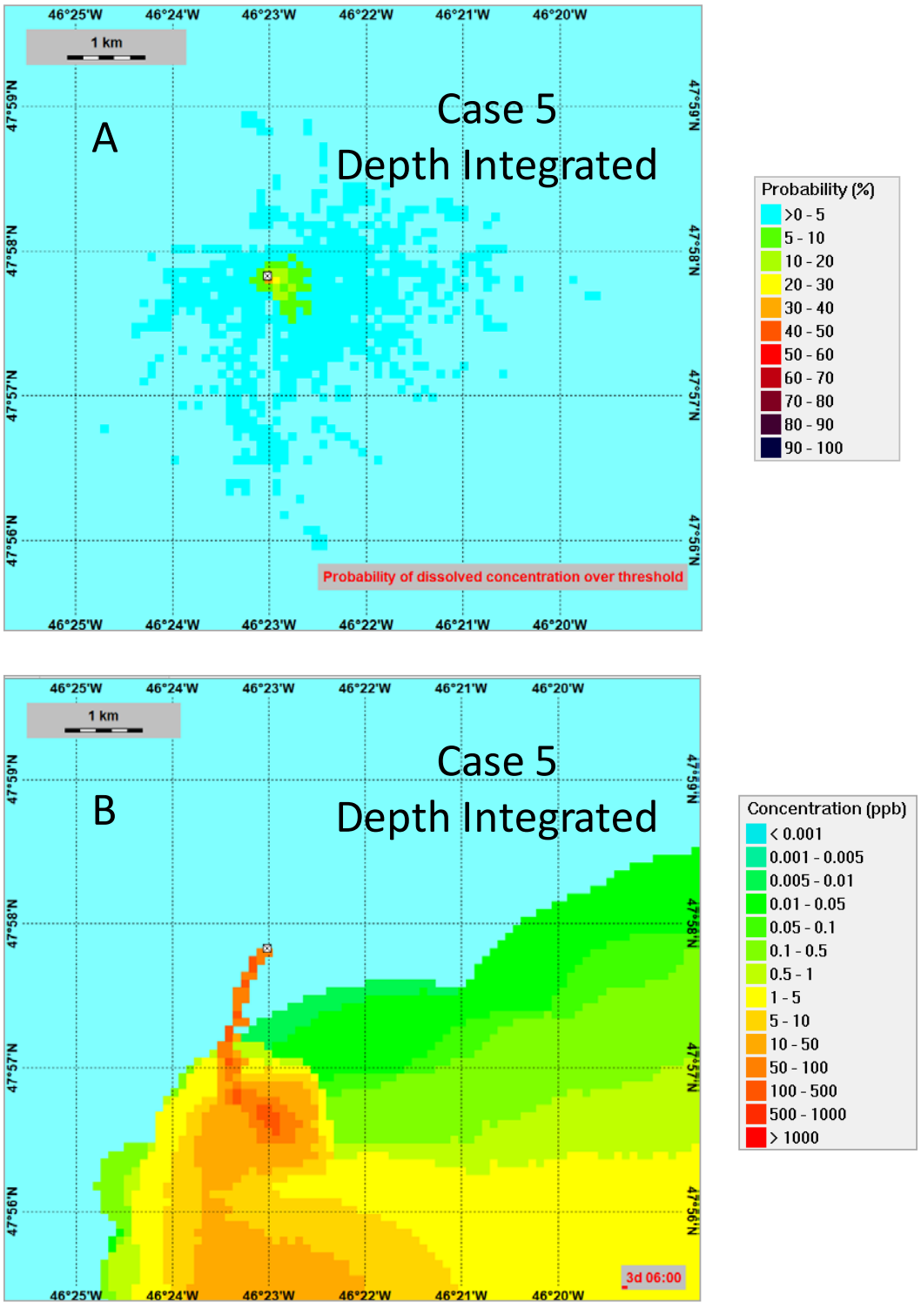

Figure 6-7 A) Probability that OIW will exceed the threshold concentration (PNEC) of 70.5 µg/L based on a 30-day simulation, and B) Maximum OIW concentrations in the near-field when concentrations were highest during a 30-day simulation.

Panel A integrates the entire simulation period; Panel B represents concentrations on day 3 at 6:00 hrs.

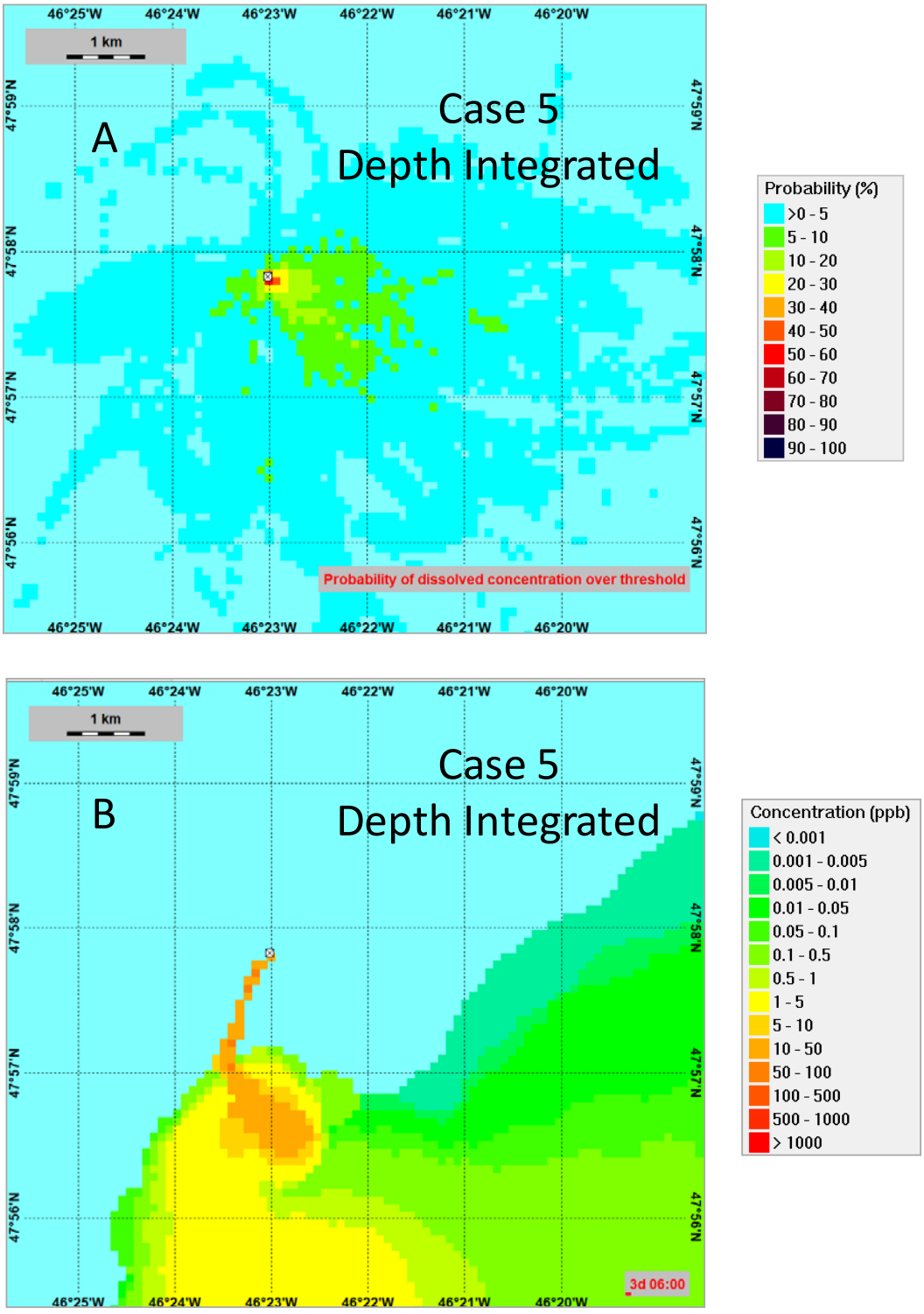

Figure 6-8 A) Probability that BTEX will exceed a no-effects concentration (PNEC) of 7.83 µg/L based on a 30-day simulation, and B) Maximum BTEX concentrations when near-field concentrations were highest during a 30-day simulation.

Panel A integrates the entire simulation period; Panel B represents concentrations on day 3 at 6:00 hrs.

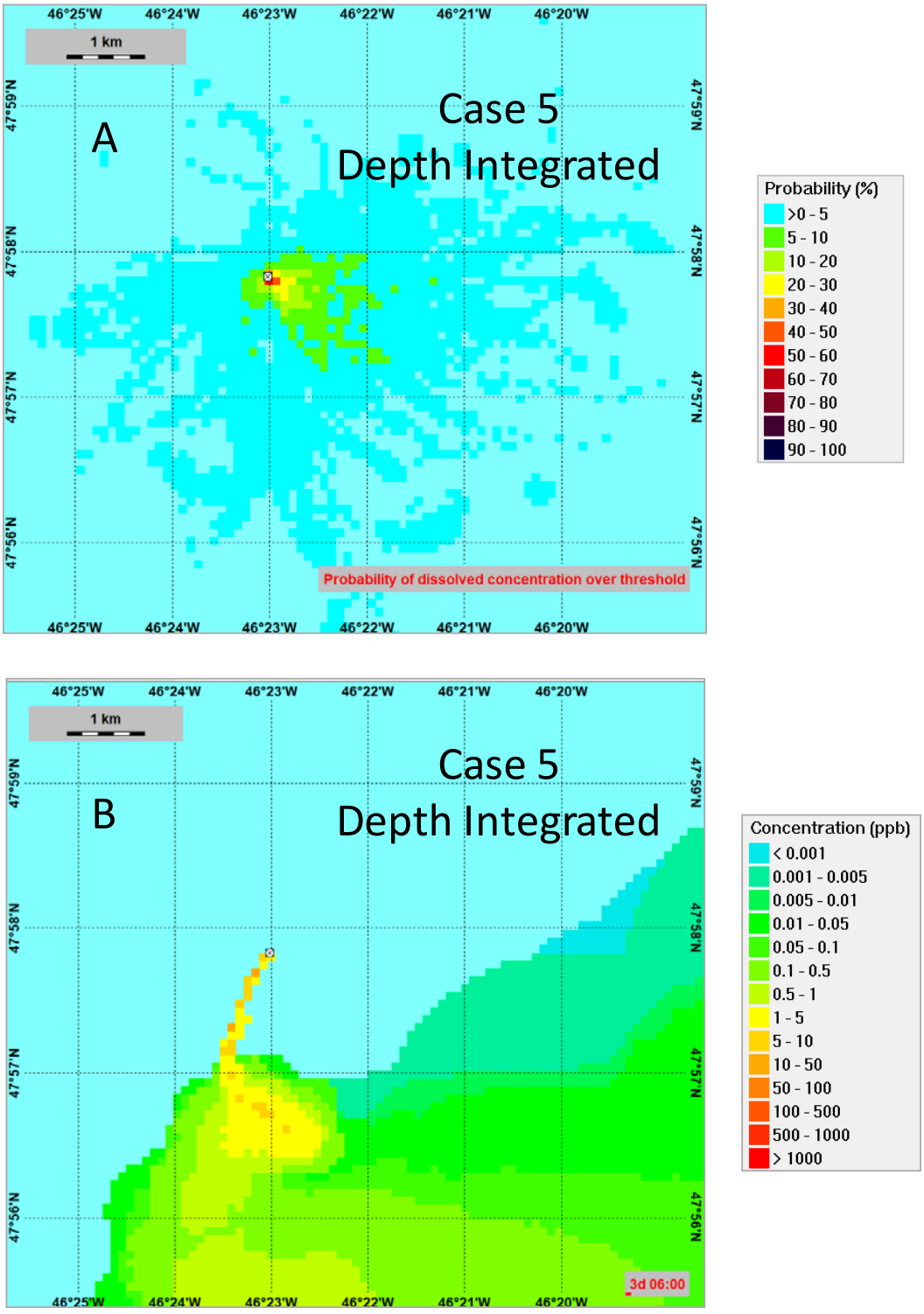

Figure 6-9 A) Probability that 2-3 ring PAHs will exceed a no-effects concentration (PNEC) of 1.86 µg/L based on a 30-day simulation, and B) Maximum 2-3 ring PAH concentrations when near-field concentrations were highest during a 30 day simulation.

Panel A integrates the entire simulation period; Panel B represents concentrations on day 3 at 6:00 hrs.

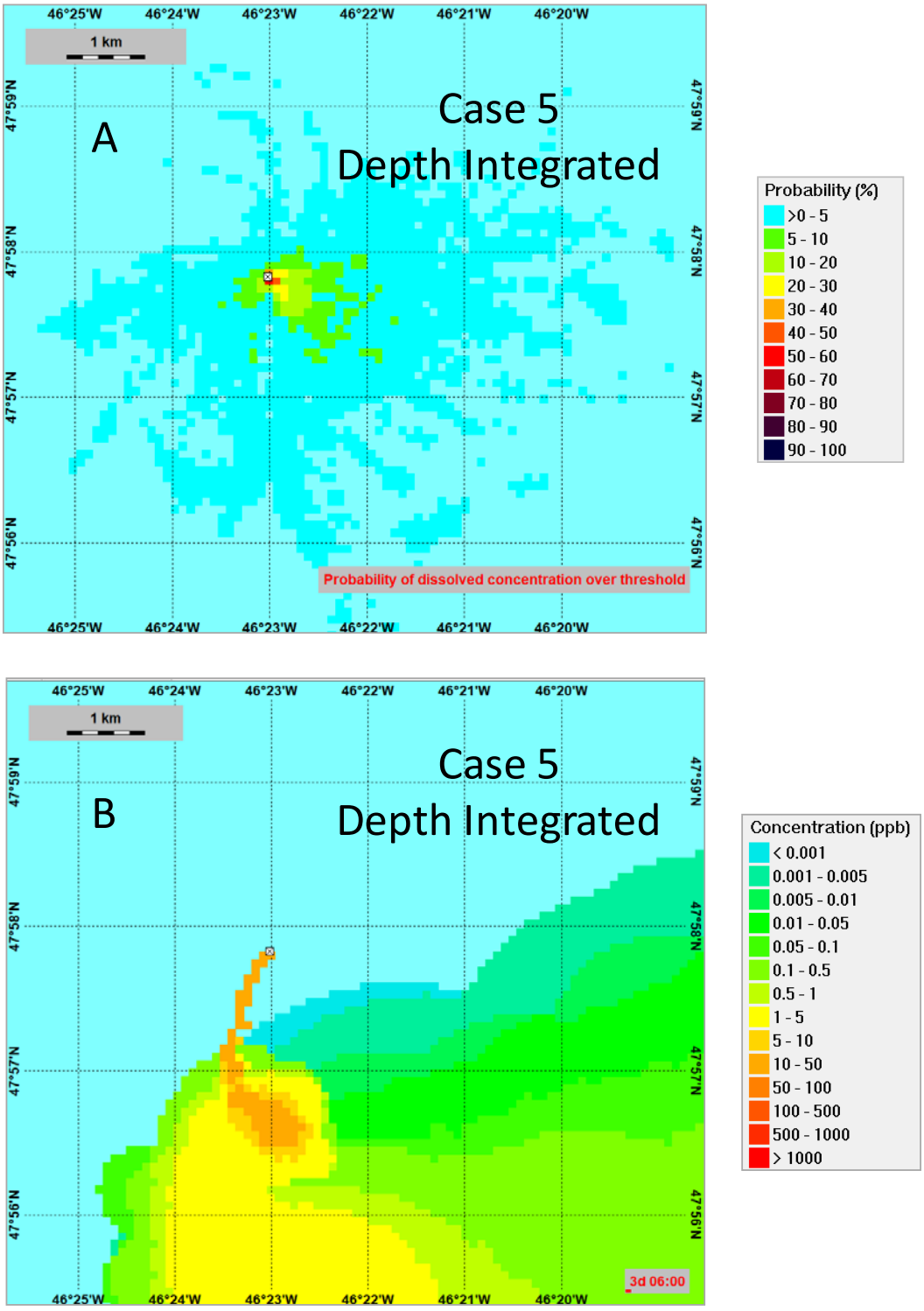

Figure 6-10 A) Probability that phenol (and C1-C3 alkyl phenols) will exceed a no-effects concentration (PNEC) of 7.7 µg/L based on a 30-day simulation, and B) Maximum phenol (and C1-C3 alkyl phenols) concentrations when near-field concentrations were highest during a 30 day simulation.

Panel A integrates the entire simulation period; Panel B represents concentrations on day 3 at 6:00 hrs.

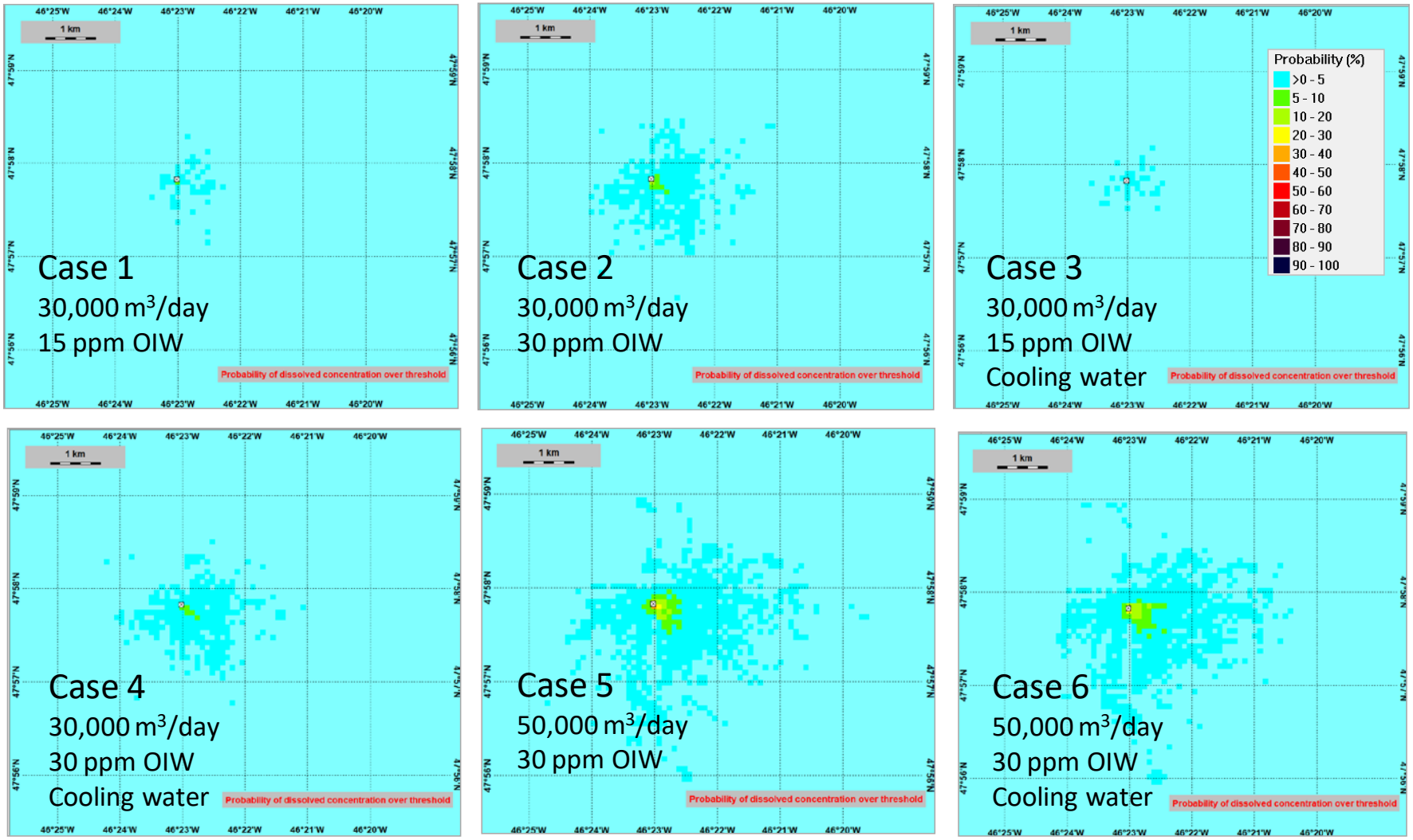

Figure 6-11 Probability that OIW will exceed a no-effects concentration (PNEC) of 70,5 µg/L. based on a 30-day simulation for Cases 1 to 6.

7 References

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APPENDIX J:

INFORMATION TO SUPPORT RESPONSE TO IR-275/ECCC-44

Table 4.7 Location and Scenarios for Produced Water Plume Dispersion Modeling

Modelling Inputs	**Latitude**		**Longitude**		**Easting (UTM Zone 23)**	**Northing (UTM Zone 23)**
Modelling location	47°57'49.65"N		46°23'0.89"W		396719.94	5313202.1
	Scenarios					
	Produced Water without Cooling Water		**Produced Water with Cooling Water**		**Produced Water Flow of 50,000m^3/day**	
	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Oil in water Concentration (ppm)	15	30	15	30	30	30
Total Flow of Release (m^3/day)	30,000	30,000	55,000	55,000	50,000	75,000
Depth of Release (m below sea surface)	20	20	20	20	20	20
Release Pipe Diameter (m)	0.6	0.6	0.6	0.6	0.6	0.6
Vertical Angle of Release (°)	180	180	180	180	180	180
Temperature of Total Flow (°C)	40	40	37.7	37.7	40	40
Salinity of Total Flow (ppt)	33	33	33	33	33	33
Produced Water Flow (m^3/day)	30,000	30,000	30,000	30,000	50,000	50,000
Cooling Water Flow (m^3/day)	0	0	25,000	25,000	0	25,000
Time of year*	June	June	June	June	June	June
*Based on data inputs for current, temperature and salinity data from June 2015						