Equinor Canada Ltd.

Bay du Nord Development Project

Summary of Environmental Impact Statement

July 2020

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LIST OF ACRONYMS

2D	Two-Dimensional
3D	Three-Dimensional
4D	Four-Dimensional
AOI	Area of Interest
ASP	Association of Seafood Producers
AUV	Autonomous Underwater Vehicle
BdN	Bay du Nord
BOP	Blowout Preventer
CA	Certifying Authority
CAAQS	Canadian Ambient Air Quality Standards
CACs	Criteria Air Contaminants
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CEA Agency	Canadian Environmental Assessment Agency
CH_4	Methane
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
CNSOPB	Canada-Nova Scotia Offshore Petroleum Board
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e/year	Carbon Dioxide Equivalent Per Year
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPAWS	Canadian Parks and Wilderness Society
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
DP	Dynamic Positioning
DREAM	Dose Related Risk and Effects Assessment Model
EA	Environmental Assessment
EBSA	Ecologically or Biologically Significant Area
ECCC	Environment and Climate Change Canada
ECCC-CWS	Environment and Climate Change Canada – Canadian Wildlife Service
EEM	Environmental Effects Monitoring
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
EL	Exploration Licence
ENGOs	Environmental Non-Government Organizations
EPP	Environmental Protection Plan

FCA	Fisheries Closure Area
FCS	Food, Social or Ceremonial
FFAW-Unifor	Fish, Food and Allied Workers-Unifor
FLO	Fisheries Liaison Officer
FPSO	Floating Production, Storage, and Offloading (facility)
GEAC	Groundfish Enterprise Allocation Council
GHG	Greenhouse Gas
GLCs	Ground-Level Concentrations
HADD	Harmful Alteration, Disruption or Destruction (of fish habitat)
HUC	Hook-up and Commissioning
IAAC	Impact Assessment Agency of Canada
IBA	Important Bird Area
IMO	International Maritime Organization
IUCN	International Union for Conservation of Nature
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
LP	Low Pressure
LSA	Local Study Area
m^3	Cubic Meters
m^3/d	Cubic Meters Per Day
m^3/h	Cubic Meters Per Hour
MARPOL	International Convention for the Prevention of Pollution from Ships
MBCA	*Migratory Birds Convention Act*
MBS	Migratory Bird Sanctuary
MCPEI	Mi'kmaq Confederacy of Prince Edward Island
MFN	Miawpukek First Nation
MMS	Mi'gmawei Mawiomi Secretariat
MPA	Marine Protected Area
MSm^3	Million Standard Cubic Meters
MSm^3/d	Million Standard Cubic Meters Per Day
MTI	Mi'gmawe'l Tplu'taqnn Inc.
NAFO	Northwest Atlantic Fisheries Organization
Nature NL	Nature Newfoundland and Labrador
NAVWARN	Navigational Warning
NCC	NunatuKavut Community Council
NEAFC	North East Atlantic Fisheries Commission
NEB	National Energy Board

NL	Newfoundland and Labrador
NLAAQS	NL Ambient Air Quality Standards
NL ESA	Newfoundland and Labrador *Endangered Species Act*
NM	Nautical Mile
nmVOCs	Non-Methane Volatile Organic Compounds
NO_x	Nitrogen Oxides
N_2O	Nitrous Oxide
NORM	Naturally Occurring Radioactive Material
NRCan	Natural Resources Canada
OA	Operations Authorization
OBC	Ocean Bottom Cables
OBN	Ocean Bottom Nodes
OCI	Ocean Choice International
OCSG	Offshore Chemical Selection Guidelines
OIM	Offshore Installation Manager
OSRP	Oil Spill Response Plan
OSV	Offshore Supply Vessel
OWTG	Offshore Waste Treatment Guidelines
PAAN	Protected Areas Association of Newfoundland
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter less than 2.5 microns in diameter
PM_{10}	Particulate Matter less than 10 microns in diameter
QMFN	Qalipu Mi'kmaq First Nation
R&D	Research And Development
RMA	Representative Marine Area
RSA	Regional Study Area
ROV	Remotely Operated Vehicle
SAR	Species at Risk
SARA	*Species at Risk Act*
SBM	Synthetic-Based Mud
SBV	Standby Vessels
SDL	Significant Discovery Licence
SEL	Sound Exposure Level
Sm^3/d	Standard Cubic Meters per Day
SIMA	Spill Impact Mitigation Analysis
SO_x	Sulphur Oxides

SOCC	Species of Conservation Concern
SOCP	Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment
SPL	Sound Pressure Level
TD	Total Depth
THC	Total Hydrocarbon
TR	Traffic Route
TSP	Total Suspended Particulates
UNCBD	United Nations Convention on Biological Diversity
UA	Unit Area
UXO	Unexploded Ordnance
VC	Valued Component
VME	Vulnerable Marine Ecosystem
VOC	Volatile Organic Compounds
VSD	Variable Speed Drive
VSP	Vertical Seismic Profiling
WAG	Water-Alternating Gas
WBM	Water-Based Mud
WHR	Waste Heat Recovery
WHRU	Waste Heat Recovery Unit
WNNB	Wolastoqey Nation in New Brunswick
WWF	World Wildlife Fund
XT	Subsea Christmas Tree

1.0 INTRODUCTION

Equinor Canada Ltd. (Equinor Canada), and its partner Husky Oil Operations Limited (Husky Energy), are proposing to develop the Bay du Nord field, which includes Bay du Nord, Bay de Verde and Bay de Verde East and the Baccalieu discovery (collectively the Core Bay du Nord [BdN] Development; the Project) for the production of oil and gas. The Project is located offshore of eastern Newfoundland and Labrador (NL), approximately 500 km east-northeast of St. John's and outside of Canada's 200 nautical mile (NM) Exclusive Economic Zone (EEZ) (Figure 1-1).

The BdN Development Project (the Project) is defined as the development of the Core BdN Development and Project Area Tiebacks. The Core BdN Development will include the offshore construction and installation, hook-up and commissioning (HUC), production and maintenance operations, drilling and eventual decommissioning, as well as associated supporting surveys, field work, and supply and servicing activities. Project Area Tiebacks would occur if additional resources of known discoveries and/or discoveries through exploration activities are tied-back to the BdN production installation. Activities that would occur under Project Area Tiebacks are the same as for Core BdN Development, including offshore construction and installation of well templates, flowlines, umbilicals, and risers in the Project area connected to the existing production installation within the Core BdN Development Area. The Core BdN Development has a life of field between 12 and 20 years. Should Project Area Tiebacks occur, production could be extended out to 30 years.

Equinor is a Norwegian-based energy organization with operations in more than 30 countries, and extensive drilling and production experience. With 20,000 employees worldwide, Equinor is a values-based organization where empowered people collaborate to shape the future of energy. Equinor's ambition is to be the world's most carbon-efficient oil and gas producer, as well as a driver of innovation in offshore wind. Equinor's approach to sustainability is based on the following principles and themes:

- Aiming for outstanding resource efficiency
- Preventing harm to local environments
- Low carbon – reducing carbon dioxide (CO_2) footprint
- Creating local opportunities
- Respecting human rights
- Being open and transparent

In 1996, Equinor Canada established a Canadian headquarters in Calgary, Alberta, and a local office in St. John's, NL. Since 2008, Equinor Canada has been active in exploration and drilling activities in the NL offshore, drilling more than 15 wells in the Flemish Pass area and culminating in the proposal of this Project. Equinor Canada holds a 65 percent interest in the BdN Development and will be the Operator, managing the Project from its St. John's office. Its partner, Husky Energy, holds a 35 percent interest.

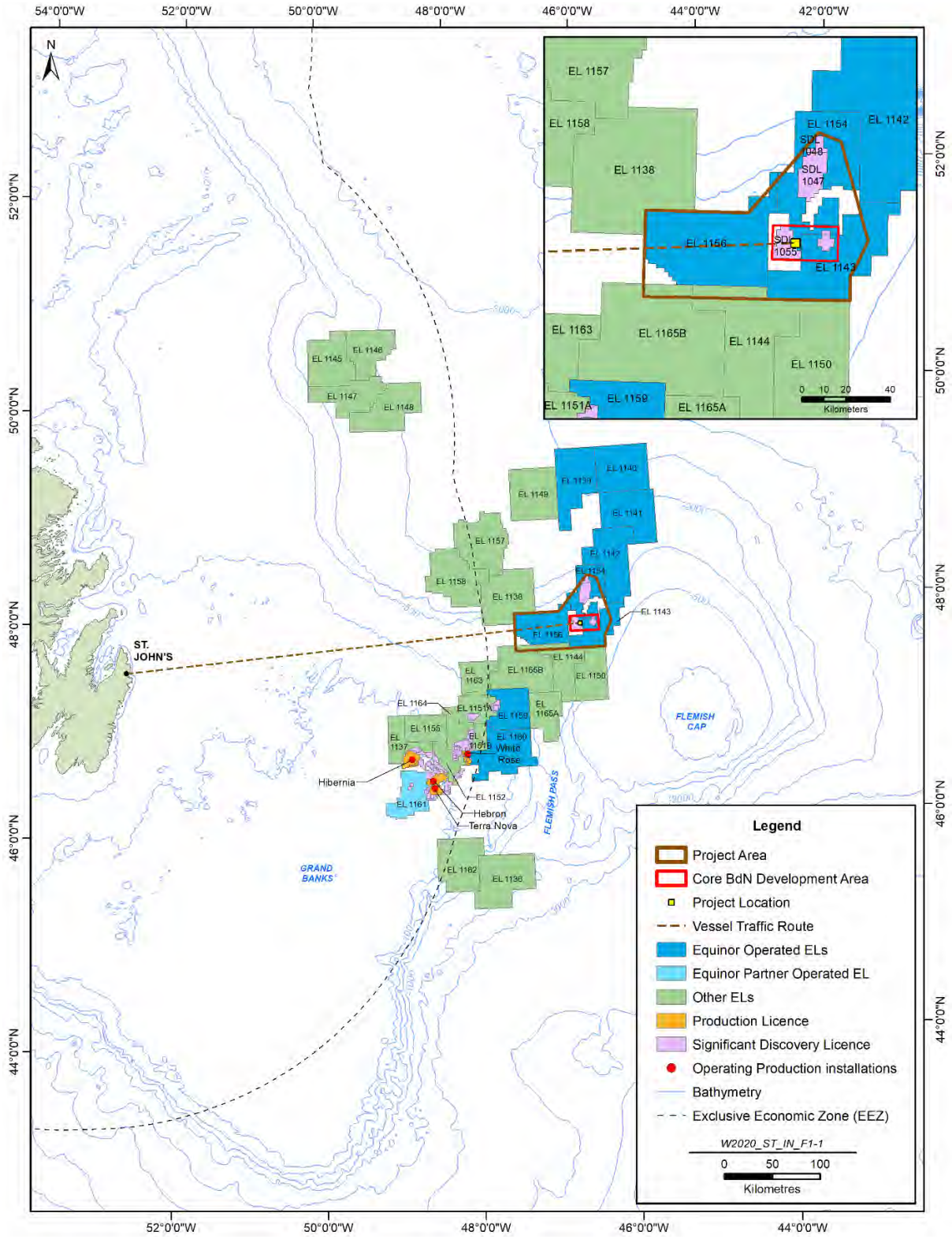


Figure 1-1 The Bay du Nord Development Project

The Project is being reviewed by the Government of Canada under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and is considered a "designated project" under Section 11 of the *Regulations Designating Physical Activities* pursuant to CEAA 2012. Under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* and the *Canada-Newfoundland Atlantic Accord Implementation Act* (the Accord Acts), the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) also requires that a project-specific environmental assessment (EA) be completed for offshore oil and gas development projects. The EA will also support the Development Plan application to the C-NLOPB.

The EA review process for the Project is intended to meet the requirements of both CEAA 2012 and the C-NLOPB's Accord Acts EA processes. An Environmental Impact Statement (EIS) has been prepared to meet the requirements of this legislation, including the Project-specific EIS Guidelines issued by the Canadian Environmental Assessment Agency (CEA Agency, now called the Impact Assessment Agency of Canada [IAAC]) on September 26, 2018, and other generic EA guidance issued by IAAC. The EIS forms the basis for review, consideration and discussion of the Project and those items identified by regulatory agencies, Indigenous groups, stakeholders and interested public as part of the EA process. Based on the results of the EA and the associated reviews and input, the Government of Canada will decide whether the Project can proceed, including associated terms and conditions. In addition to the CEAA 2012 EA and C-NLOPB regulatory approval processes, other federal permits and authorizations may be required by the Project.

This EIS summary has been prepared to give readers an understanding of the Project, potential environmental effects, proposed mitigation measures, and the significance of residual environmental effects. The structure and content of this summary reflects the requirements found in the Project-specific EIS Guidelines and is available in both French and English. For more detailed information about the Project and the results of the environmental effects assessment, please refer to the full EIS.

2.0 PROJECT OVERVIEW

This chapter provides an overview of the Project, including its need, purpose and rationale, benefits, and alternatives. It describes the Project, including its location, key components and activities, preliminary schedule, potential waste discharges and emissions and their management, ongoing and future planning and design processes, and Equinor Canada's relevant environmental planning and management systems. For a more detailed description of the Project, refer to Section 2 of the EIS.

2.1 Project Scope

As described earlier, the Project includes the production of oil and gas (the latter for fuel and other operational purposes) from the BdN field and the Baccalieu discovery, collectively referred to as the Core BdN Development. The Core BdN Development scope includes offshore construction, installation and HUC, production and maintenance operations, drilling activities, supply and servicing, supporting surveys, and decommissioning. An overview of each of the activities is provided in Section 2.6 of this summary.

As noted in Section 1.0, the Project scope also includes Project Area Tiebacks, if additional economically recoverable reserves within the Project Area are developed. The Project Area therefore includes lands adjacent to the Core BdN Development Area where Equinor Canada has majority interests in other exploration licenses (ELs) and significant discovery licenses (SDLs) (Figure 1-1).

Crude oil will be offloaded from the production installation to shuttle tankers. While the Project includes the offloading of crude to shuttle tankers and their movement and hook-up / disconnect within the Project safety zone, the transshipment of crude is not within the scope of the Project.

No land-based activities are associated with this Project or included within its scope. Equinor Canada will not be constructing new fabrication or construction facilities for its own use. The production installation, subsea infrastructure, topsides, and processing utilities will be constructed at existing fabrication yards either locally or internationally. The Project will also rely on existing supply bases, shore base facilities, and helicopter bases on the Island of Newfoundland, which are owned and operated by independent third-party service providers.

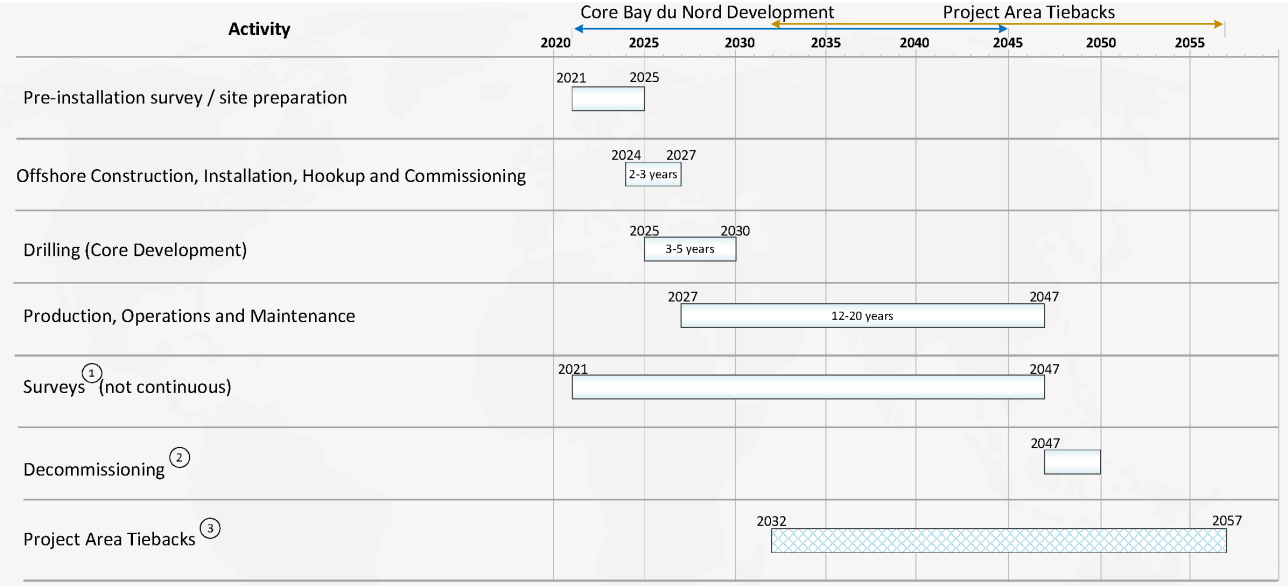
Table 2.1 provides an overview of the estimated timeframe for each of the Project phases and associated activities, as defined by the Project scope, and Figure 2-1 provides a high-level, preliminary schedule. Note, the timing is based on current Project design, and activities may commence earlier or later than indicated.

Table 2.1 Anticipated Timing of Project Activities

Project Phase	Anticipated Timeframe
Core BdN Development	
Offshore Construction and Installation and HUC	• Site surveys, commencing as early as 2021 • Offshore construction as early as 2023 • Approximately 5 years; seasonal to year-round • Offshore HUC – likely to be carried out over a four-month timeframe; any time of the year
Production and Maintenance Operations	• Commencement as early as 2026 • 12 to 20 years; year-round
Drilling Activities	• Commencement as early as 2024, • On average, drilling time is approximately 45-85 days per well (may be shorter for pilot wells and/or sidetracks) • Likely to occur in campaigns, with a set number of wells drilled per campaign • Drilling may occur at any time over life of project • Drilling will be carried out year-round when it occurs
Supply and Servicing	• Commencing as early as 2021 • Ongoing throughout life of Project; year-round
Supporting Surveys	• Commencing as early as 2021 • Ongoing throughout life of Project • Short-term (e.g., weeks to months) • Activities may be carried out at any time of the year
Decommissioning	• Commencing either at end of Core BdN Development phase or at end of Project life if Project Area Tiebacks are developed) • Approximately 2 to 4 years; year-round
Project Area Tiebacks	*Extension of Project life to a maximum of 30 years*
Offshore Construction and Installation and HUC of subsea tiebacks	• As required, depending on need for tiebacks • Up to five tiebacks could be undertaken with associated subsea infrastructure • Likely seasonal activity, as with Core BdN Development, but activities could occur year-round • May occur at any time over life of Project
Production and Maintenance Activities	• Continuation of activities from existing FPSO out to end of Project life • Year-round
Drilling Activities from additional well templates	• Total timeframe for drilling depends on number of wells required • On average, drilling time is approximately 45-85 days per well • Likely to occur in campaigns, with a set number of wells drilled per campaign • Drilling may occur at any time over life of Project. • Drilling will be carried out year-round when it occurs

Table 2.1 Anticipated Timing of Project Activities

Project Phase	Anticipated Timeframe
Supply and Servicing	• Continuation of ongoing activities to end of Project life • Year-round
Supporting Surveys	• Ongoing throughout life of Project • Short-term (e.g., weeks to months) • Activities may be carried out at any time of the year
Decommissioning	• Commencing at end of Project life • Approximately 2 to 4 years; year-round



(1) Surveys include geohazard, geotechnical, geological, environmental and seismic. May occur at any time during project life and therefore depicted as a continuous bar although they are not continuous surveys.
(2) Decommissioning will occur at end of production operations, whenever that occurs. Shown as 2045 for illustration purposes.
(3) Project Area Tieback activities, if they occur, may happen at any time during the project life
(4) Dates shown above are the earliest possible start / finish dates. These are subject to change.

Figure 2-1 Preliminary Project Schedule – Earliest Possible Start Dates

2.2 Purpose and Benefits of the Project

The purpose of the Project is to develop the Bay du Nord field and the Baccalieu discovery (i.e., the Core BdN Development) for the production of oil and gas. The C-NLOPB issued SDL 1055 (Bay du Nord L-76Z) to Equinor Canada (65 percent) and Husky Energy (35 percent) on November 17, 2017. SDL 1055 is 13,149 hectares (ha) in size with coordinates of: 48 10'N, 46 15'W; 48 00'N, 46 15'; and 48 00'N, 46 30'W. The C-NLOPB issued SDL 1056 and SDL 1057 (Baccalieu discovery) to Equinor Canada (65 percent) and Husky Energy (35 percent) on June 28, 2019. An SDL application for the Harpoon discovery is being progressed.

As the province's fifth offshore oilfield development project, the Project will be a major contributor to the economic development of NL, building on and contributing to the existing multi-phase offshore petroleum industry. Equinor Canada is committed to creating and optimizing opportunities and benefits for NL and Canadian workers and companies as part of its activities and operations in the Canada-NL Offshore Area, and to carrying out its business in full compliance with the Atlantic Accord Acts and other applicable requirements. Through the Framework Agreement between Equinor Canada and the province of Newfoundland and Labrador, the Project will contribute the following:

- Estimated $3.5 billion in government revenue
- 22.3 million person hours of employment or 11,000 person years
- Approximately $300 million in R&D with a minimum of $75 million of that focused on R&D and education with a focus on subsea technology, digitalization, renewable energy solutions and ocean innovation
- Significant investment in new technology to increase the local supply capacity
- Establish an Integrated Operations Center with up to 50 positions in operations, logistics, engineering, health, safety and environment, information technology and other positions
- High-speed data transfer to shore as an enabler of digitalization
- Develop a supply and service forum to dedicate resources that will identify business opportunities and foster operator-supplier collaboration and global competitiveness

Equinor Canada will submit a Canada-NL Benefits Plan to the C-NLOPB, which will identify and describe measures regarding the employment of residents of NL and other Canadians and the further increase of local skills, capabilities, and experience. The Plan will also seek to provide manufacturers, consultants, contractors, and service companies in the province and other parts of Canada a full and fair opportunity to participate on a competitive basis in the supply of goods and services, further expanding NL's global supply and service sector. During the operational phase, there will be employment opportunities in areas such as logistics, engineering and technical support, drilling and production, marine support vessels (e.g., helicopters, supply vessels, tankers), and catering. The capabilities of NL companies and individuals working on the Project will be further developed, enabling them to compete internationally for future opportunities.

The Project will also contribute to energy diversity and supply and contribute substantial revenues to the Government of NL through corporate taxes and royalty payments. If approved, the Project will extend the life of the offshore oil and gas industry in NL, representing an important next step in the development of a sustainable offshore oil and gas industry.

Further information on the environmental, economic and social benefits of the Project are found in Section 2.2 of the EIS.

2.3 The Bay du Nord and Baccalieu Discoveries

The Core BdN Development is composed of three reservoir intervals within fault-bounded geologic structures called Bay du Nord, Bay de Verde, and Baccalieu (Figure 2-2).

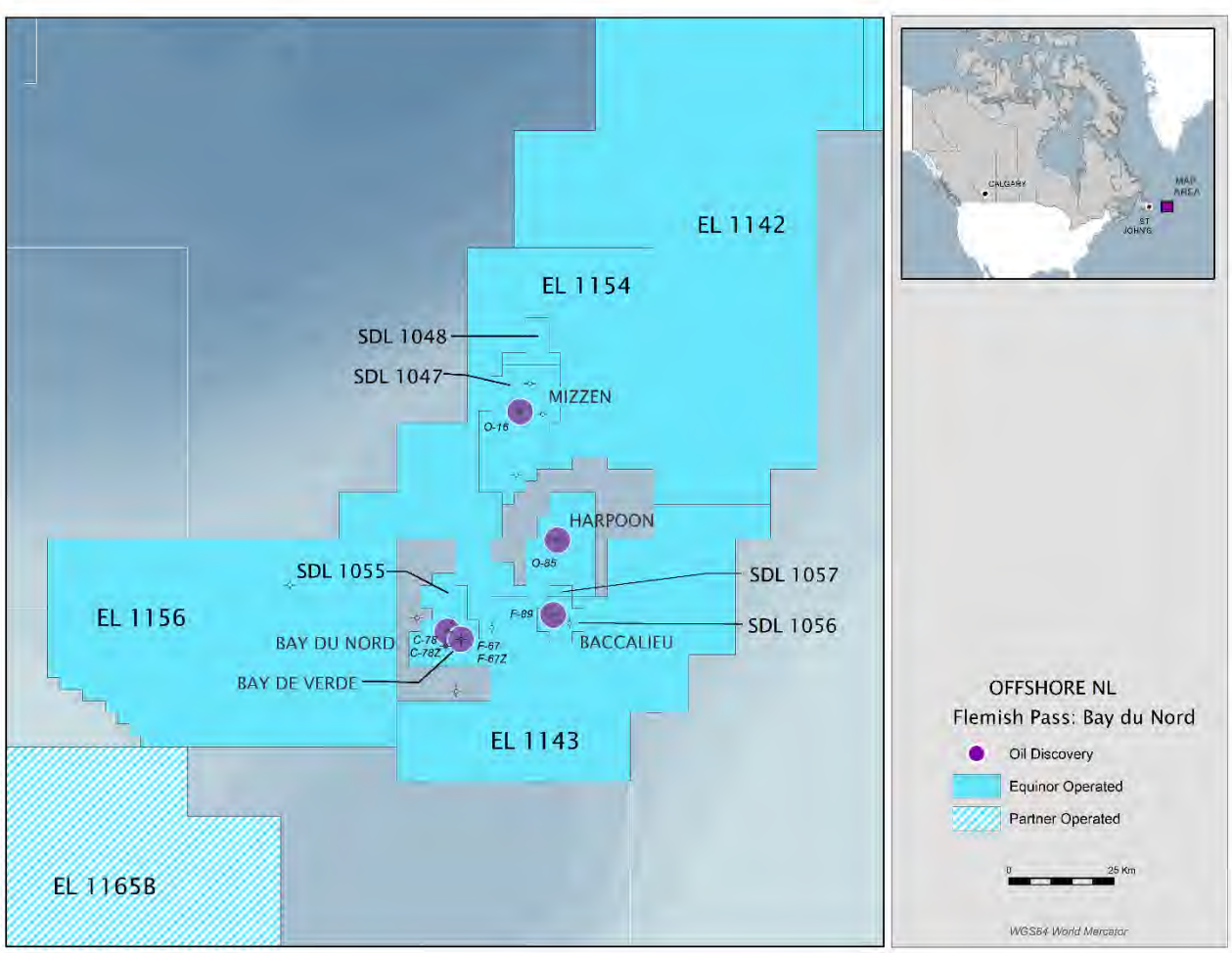


Figure 2-2 Location of the Bay du Nord Development Area

The high-quality reservoir in the BdN and Bay de Verde structures will allow for high initial production rates. The Project intends to use produced solution gas for fuel, artificial lift, and injection to displace oil. This is in addition to water injection. As gas is reinjected into the producing interval(s), the field gas-oil ratio will increase prior to decreasing as more gas is consumed for fuel. Development of the Baccalieu field may extend the Project's production plateau.

The field development strategy for the Core BdN Development is currently under evaluation. Potential well count (which includes side-tracks and/or pilot wells) for the Core BdN Development ranges from 10 to 40 wells, including five to 20 producing wells and five to 20 injection wells depending on the outcome of ongoing field development evaluations, delineation of the reservoirs through development drilling and evaluation of future improved oil recovery opportunities. Based on ongoing design, the initial Core BdN Development will likely require approximately 19 wells (9 producers and 10 injectors) but the total well count remains at 40 wells to include for the possibility of side-tracks, pilot wells and additional production/injector wells depending on evaluation of improved recovery opportunities. Pilot wells may be required to provide additional information on the reservoir, in particular the assessment of shallow hazards, before development wells are drilled.

These wells are typically drilled at depth up to 500m and within 25m of the template location. It is expected that resources will be developed via subsea wells, drilled from subsea templates and/or individual satellite wells and tied-back to a floating production installation through subsea flowlines and risers. Up to an additional 20 wells could be drilled as part of Project Area Tiebacks from subsea infrastructure tied-back to the existing production installation.

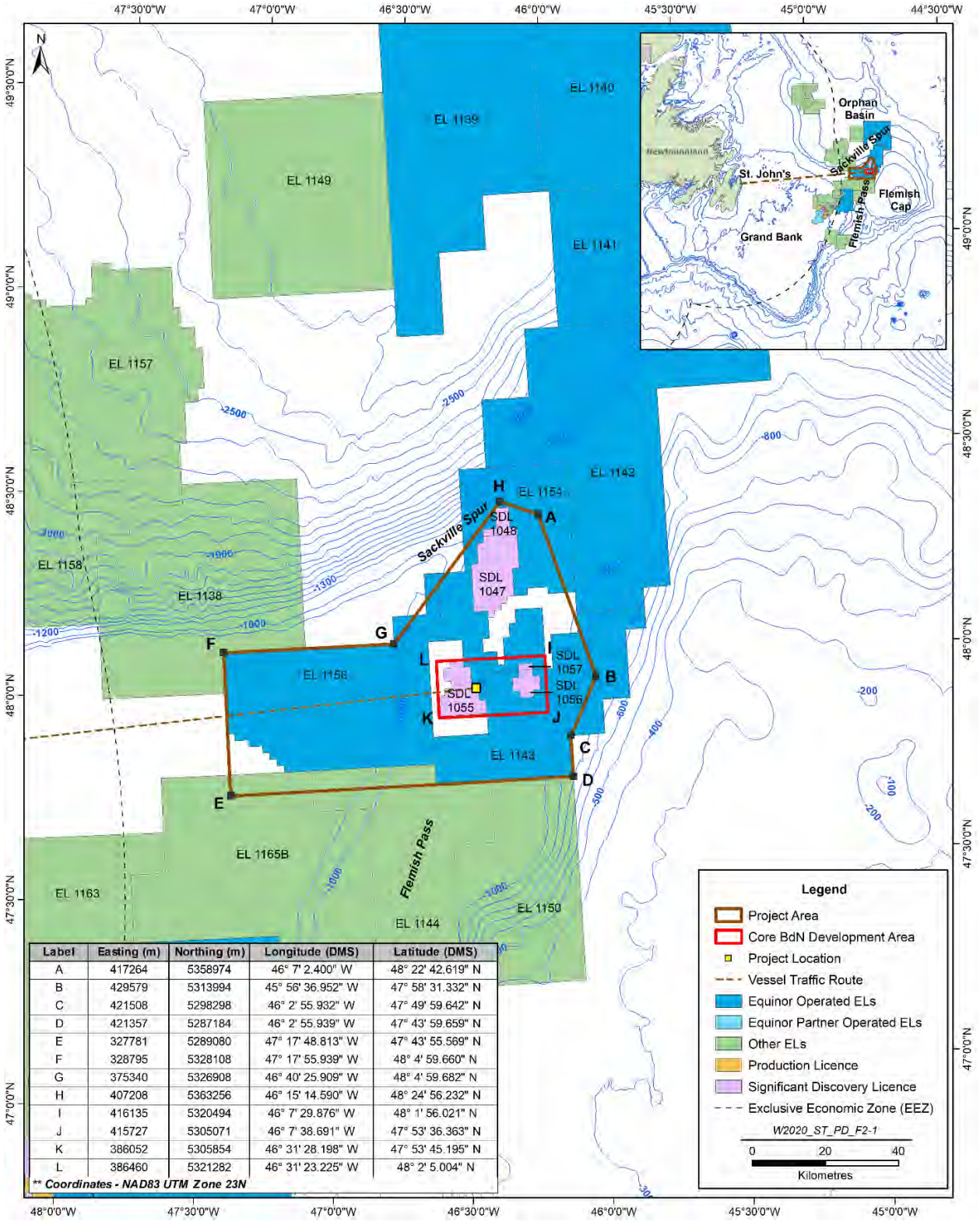
2.4 Project Location

The Project is in the Flemish Pass area of the Canada-NL offshore area, approximately 500 km east-northeast of St. John's, NL (Figure 2-3). The Project Area, approximately 4,900 km² in size, is where planned Project components and activities will take place, based on the scope of the Project described in Section 2.1. Water depths in this area range from approximately 340 m to 1,200 m (Figure 2-4). The Project Area includes other ELs and SDLs in which Equinor Canada has majority interest. (Figure 2-3). These lands may be included in Project Area Tiebacks and are therefore included in the Project Area.

The Core BdN Development will occur primarily within SDL 1055, SDL 1056 and SDL 1057 and portions of EL 1143 and EL 1157. This area is referred to as the Core BdN Development Area and is approximately 470 km², with water depths ranging from 1,000 m to 1,200 m (Figure 2-4). Based on the current stage of design, the footprint of the Project facilities on the seabed will cover approximately 7 km².

Resource use in and near the Project Area is characterized by commercial fishing and oil and gas exploration and production activities. Fishing enterprises associated with various Indigenous groups currently hold commercial-communal fishing licences for Atlantic bluefin tuna and swordfish in Northwest Atlantic Fisheries Organization (NAFO) Divisions 3L and 3M, which are large areas that overlap portions of the Core Area and Project Area. Through engagement, Indigenous groups have indicated that commercial-communal licences for swordfish and tuna are currently inactive off Eastern Newfoundland.

The closest operating offshore oil and gas production facility is White Rose, which is approximately 180 km to the southwest of the proposed Core BdN Development Area. Terra Nova is approximately 230 km southwest, and Hibernia and Hebron are approximately 225 km southwest of the Core BdN Development Area. Other activities that may also take place in the region include general shipping traffic, fisheries survey programs undertaken by Fisheries and Oceans Canada (DFO) and/or industry, marine research surveys conducted by government and/or educational institutions, and naval training exercises. There are several marine cable networks in the region, including a fibre optic cable network connecting the Hibernia and Hebron Platforms to the Avalon Peninsula. There is no other major existing infrastructure within or near the Project Area. Section 6.4 of the EIS and Section 6.5.1 of this summary provides an overview of special areas within and adjacent to the Project Area.



Label	Easting (m)	Northing (m)	Longitude (DMS)	Latitude (DMS)
A	417264	5358974	46° 7' 2.400" W	48° 22' 42.619" N
B	429579	5313994	45° 56' 36.952" W	47° 58' 31.332" N
C	421508	5298298	46° 2' 55.932" W	47° 49' 59.642" N
D	421357	5287184	46° 2' 55.939" W	47° 43' 59.659" N
E	327781	5289080	47° 17' 48.813" W	47° 43' 55.569" N
F	328795	5328108	47° 17' 55.939" W	48° 4' 59.660" N
G	375340	5326908	46° 40' 25.909" W	48° 4' 59.682" N
H	407208	5363256	46° 15' 14.590" W	48° 24' 56.232" N
I	416135	5320494	46° 7' 29.876" W	48° 1' 56.021" N
J	415727	5305071	46° 7' 38.691" W	47° 53' 36.363" N
K	386052	5305854	46° 31' 28.198" W	47° 53' 45.195" N
L	386460	5321282	46° 31' 23.225" W	48° 2' 5.004" N

** Coordinates - NAD83 UTM Zone 23N

Figure 2-3 Project Location and Project Area

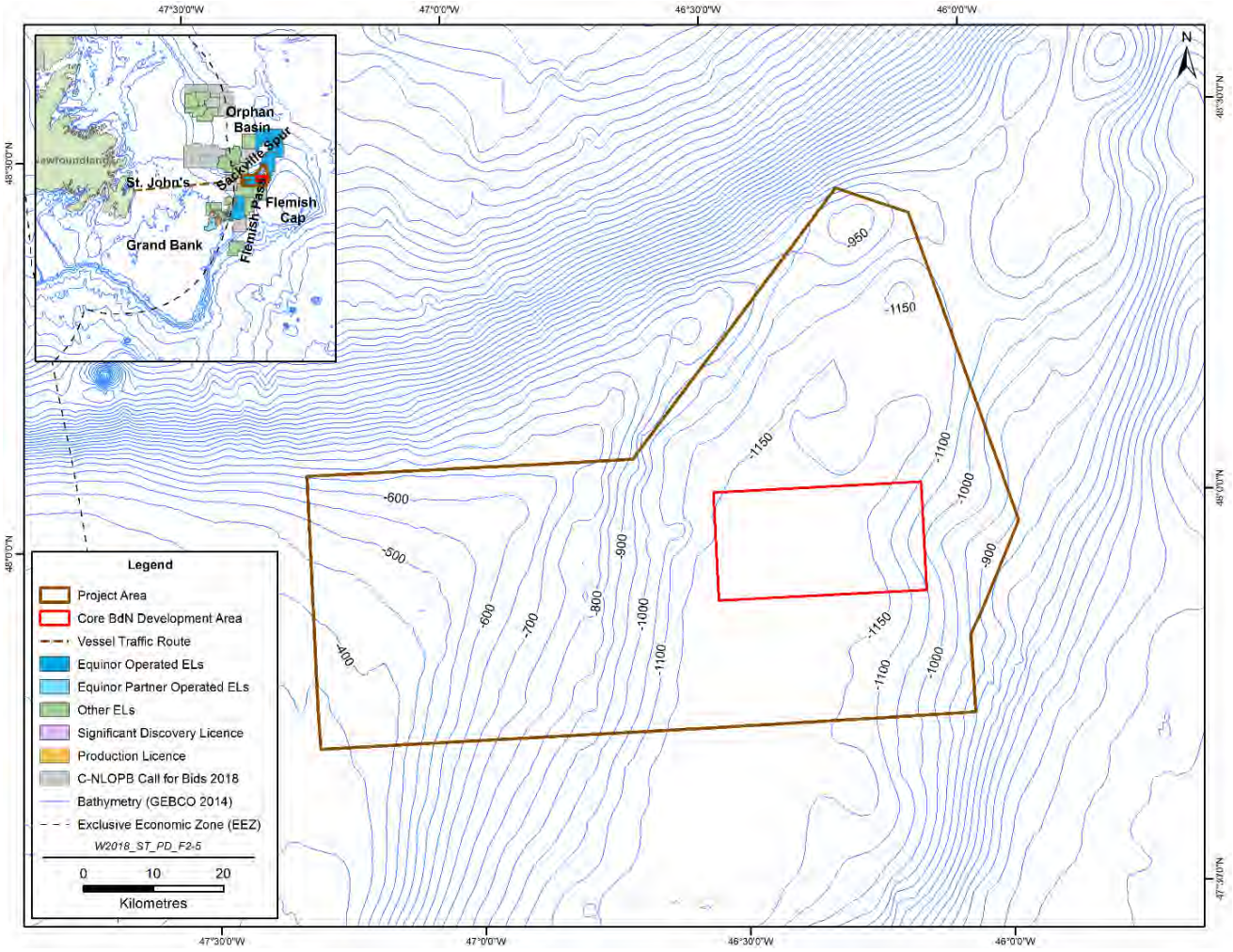


Figure 2-4 Bathymetry of Project Area

2.5 Project Concept and Design

The following sections provide an overview of the preferred concept and design basis for the development of the Core BdN Development. The Core BdN Development is currently at a conceptual stage of planning, which means that details regarding Project design, reservoir management and production operations are under consideration and subject to refinement.

2.5.1 Project Design

An overview of the design basis for the Core BdN Development is provided in Table 2.2. The design basis values listed are representative of peak production; the EIS used the upper limit of these ranges in the associated environmental effects assessment.

Table 2.2 Bay du Nord Project – Design Basis

Component	Core BdN Development	Project Area Tiebacks
Facilities Design Life	25 to 30 years	Same as Core BdN Development
Field Life	12 to 20 years	Extension of core field life to maximum of 30 years
Area	Core BdN Development Area, see Figure 2-3	Project Area, including the Core BdN Development Area - see Figure 2-3
Project Area Water Depth (m)	1,000 to 1,200	340 to 1,200
Crude Oil Properties	approximately 35 API	Same as Core BdN Development
Production Installation		
FPSO	FPSO	Tie back to existing FPSO or to existing well template infrastructure
Crude Oil Production (m^3/d)	15,000 to 30,000	Same as Core BdN Development
Crude Oil Storage (m^3)	approximately 160,000	Maximum rates will be the same as Core BdN Development
Water Production (m^3/d)	30,000 to 50,000	Maximum rates will be the same as Core BdN Development
Cooling Water Intake (m^3/d)	20,000 to 80,000 High uncertainty as design is ongoing	Maximum rates will be the same as Core BdN Development
Seawater Injection (m^3/d)	32,000 Based on design capacity	Maximum rates will be the same as Core BdN Development
Gas Production (MSm^3/d)	2.0 to 2.8	Maximum rates will be the same as Core BdN Development
Gas Injection (MSm^3/d) (All gas not used as fuel)	2.5	Maximum rates will be the same as Core BdN Development
Fuel Gas (MSm^3/d)	0.1 to 0.3	Maximum rates will be the same as Core BdN Development
Crude Offloading Rate (m^3/hr)	Up to 8,000	Maximum rates will be the same as Core BdN Development
Flaring Estimates (Sm^3/d) – low-pressure (LP) flare gas recovery assumed; non-routine/safety flaring only; start up rates may be higher	3,000 to 5,000 (average) May be higher in first year production	Maximum rates will be the same as Core BdN Development
Construction and Installation, and HUC		
Activities	Seasonal over 3 to 5 years	As required depending on need for tiebacks
Subsea Infrastructure		
Subsea Well Templates, (combination of 4-slot, 6-slot and 8-slot templates and individual satellite wells)	3 to 10	1 to 5, either connected back to FPSO or existing well template infrastructure
Riser Base	Up to 4	Number may increase depending on number of tiebacks

Table 2.2 Bay du Nord Project – Design Basis

Component	Core BdN Development	Project Area Tiebacks
Drilling		
Total Number of Wells	Maximum 40 wells (including pilot wells and side tracks)	Up to an additional 20 wells
- Production Wells	5 to 20	Estimate 10 producers
- Injection Wells	5 to 20	Estimate 10 injectors
Supporting Surveys		
Activities	As required year-round, throughout life of Core BdN Development	As required year-round throughout life of Project

2.5.1.1 Production Installation

Equinor Canada evaluated a number of development options for the Project with each option evaluated on its ability to operate in the water depths of the Project Area and distance to onshore and offshore facilities, as well as its ability to store crude and offload to shuttle tankers offshore, disconnect for icebergs or extreme weather events and be ice-strengthened.

Based on the evaluation, a floating production, storage and offloading (FPSO) facility was chosen as the preferred development concept. FPSO facilities can process, store, and offload crude oil from a single installation and would be suitable for the water depths in the Core BdN Development Area. While the FPSO would be moored in place, it would have the ability to disconnect and transit as a marine vessel in the event of a potential iceberg encroachment, extreme weather event, or if required for other purposes such as shore-based maintenance. The hull of the FPSO can be ice-strengthened to protect against ice. Stored crude oil can be offloaded to shuttle tankers. Decommissioning costs associated with a FPSO tend to be lower than other options as the FPSO can be easily moved off location. Decommissioned FPSOs could also be used in other locations or re-purposed for other marine use. Further information on this evaluation process can be found in Section 2.5.1 of the EIS.

The FPSO will have the capacity to handle crude oil production, storage and export, gas management, water injection, and the management of produced water and other wastes for a production life of 30 years. Figure 2-5 is an illustration of the currently proposed FPSO for the Project.

Figure 2-5 Illustration of the Proposed BdN FPSO

The FPSO will be designed to operate in the harsh environmental conditions of the Flemish Pass. To operate in the Canada-NL offshore area, the production installation will require a Certificate of Fitness to be issued from a recognized independent third-party Certifying Authority (CA). This certification provides independent third-party assurance and verification that the production installation is fit for purpose, functions as intended, and remains in compliance with the regulations without compromising safety and polluting the environment.

Based on current design, the FPSO hull will support topsides process facilities, helideck, accommodations, life saving equipment and flare tower. There will be no routine flaring from the production process. Flare gas from continuous low-pressure sources (e.g., produced water degassing, crude oil heater, and gas from cargo tanks being displaced during production) will be recovered back to the process. This will eliminate the emissions associated with routine flaring. A pilotless flare design to reduce air, light, and heat emissions typically experienced from a continuous pilot flare is currently being considered. Safety and regulatory compliance aspects will also need to be evaluated for the final flare design selection.

The FPSO will be connected to its moorings via the turret. Flowlines and umbilicals will be tied-in via the turret. The FPSO will have tandem offloading capability to offload the oil from the FPSO storage tanks onto a shuttle tanker. Telecommunications systems, to provide communication between the FPSO and onshore support, will be provided either through a fibre optic cable or satellite communications.

The FPSO will be designed to accommodate a maximum of approximately 110 personnel; however, during normal operations, the number of personnel on board is expected to be much lower.

2.5.1.2 Subsea Infrastructure

Subsea infrastructure will be designed to operate in deep water and will likely include: well templates with wellhead and wet trees (production, water and gas injection); production and water injection manifolds; flowlines (gas injection, production, water injection); FPSO / turret moorings; riser bases; umbilicals; and a fibre optic cable. Figure 2-6 provides a schematic of a layout of typical subsea development and is representative of the proposed Core BdN Development.

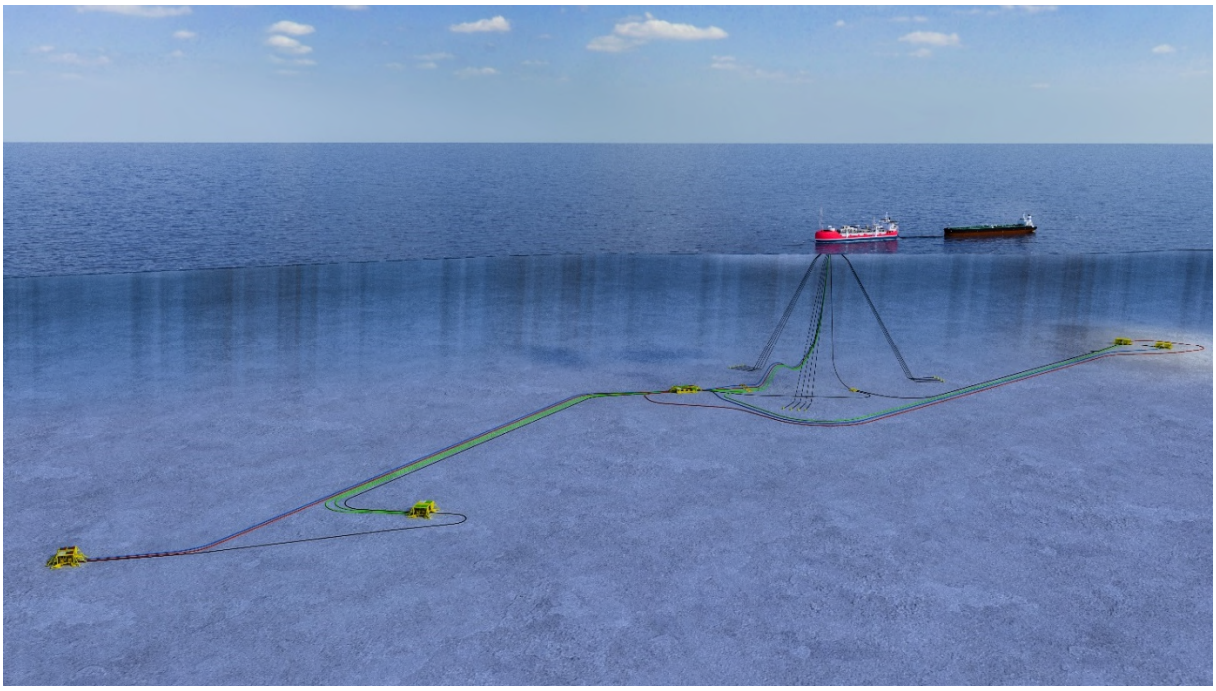


Figure 2-6 Illustration of a Typical Subsea Development - Representative of the Core BdN Development (Not to Scale)

Between three and ten well templates, with a combination of four-slot, six-slot, and eight-slot templates, and/or individual wells are currently planned. Due to the water depth in the Core BdN Development Area, there is no plan to house the subsea well equipment in excavated drill centres for iceberg protection, such as those that are used in the shallower Jeanne d'Arc Basin area. Well templates may have external protection against dropped objects or other external interferences. Figure 2-7 is an illustration of subsea well templates used for other projects and do not necessarily represent the well template design for the Project.

Figure 2-7 Illustration of Representative Subsea Well Templates – four-slot (left) and eight-slot (right)

The flowline corridors will include a production flowline, a water injection flowline, gas injection flowline, and umbilicals. Each flowline / umbilical will need a corridor of approximately 10 m between each flowline, for a total width of the corridor of approximately 30 m to 40 m.

2.5.1.3 Drilling Installation

Wells will be drilled and completed using either a floating semi-submersible or a drillship, depending on availability and operability offshore NL. A schematic of a semi-submersible and drillship is provided in Figure 2-8. For the purposes of the EIS, it is assumed that up to two drilling installations could be actively engaged in drilling activities in the Project Area at any one time.

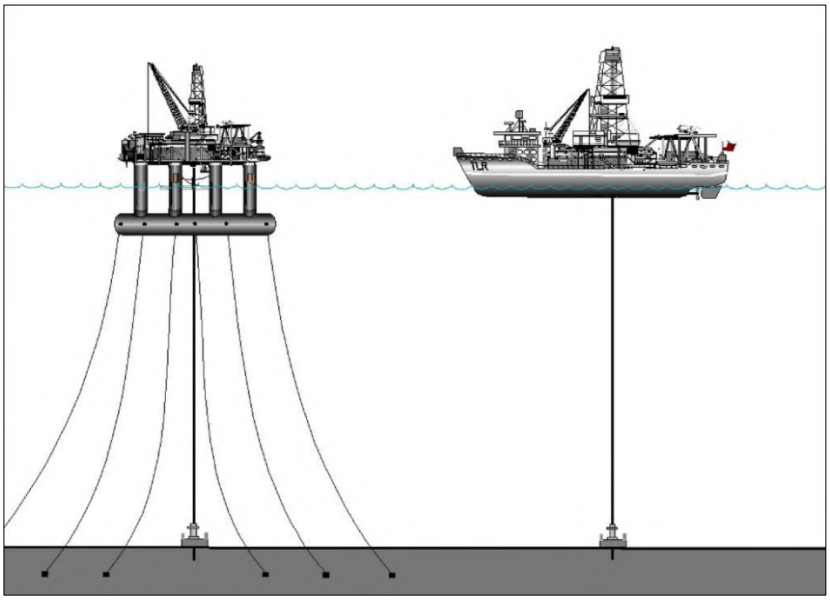


Figure 2-8 Schematic of an Anchored Semi-submersible and a Drillship

Equinor Canada's drilling installation selection process includes consideration of several factors, including drilling target depth; water depth at drilling location; oceanographic and meteorological conditions; and technical capability. The drilling installation must be winterized as year-round drilling will be undertaken. To operate in the Canada-NL offshore area, a drilling installation also requires a Certificate of Fitness to be issued from a recognized independent third-party CA.

A semi-submersible (Figure 2-9) consists of a number of vertical pillars extending up from a horizontal system of pontoons to an upper deck. Semi-submersible drilling installations can either be moored in position over the drilling site using mooring lines and anchors (generally in water depths <500 m) or maintained on station by a dynamic positioning (DP) system (generally in water depths >500 m). In DP mode, position is maintained by the drilling installation's thrusters, controlled by a computerized DP system and acoustic positioning system. A drillship (Figure 2-10) is a self-propelled ship-shaped drilling installation with larger storage capacity than a semi-submersible for drilling ultra-deep water wells. Drillships also use DP systems to maintain position at the well site and to rotate the ship into prevailing weather.

Source: Seadrill (2017)

Figure 2-9 West Hercules – Example of a Semi-Submersible

Source: Stena Drilling (2017)

Figure 2-10 Stena Carron - Example of a Drillship

2.5.2 Safety and Anti-Collision Zones

As required by regulations under the Accord Acts, the subsea infrastructure will be demarcated by a safety zone. The safety zone does not prohibit entry by other ocean users. It is a zone in which Equinor Canada as the operator will have a duty to take reasonable measures to warn persons who are in charge of vessels and aircraft of the safety zone boundaries, of the facilities within the safety zone, and of related potential hazards (e.g., the presence of subsea infrastructure). As required by regulations, the safety zone extends 500 m from the edge of the installations. The safety zone will surround all subsea infrastructure, the FPSO and its moorings, and the drilling installation and is approximately 30 km² (Figure 2-11).

In accordance with Canadian and International maritime regulations, an anti-collision zone will also be established within the safety zone around the FPSO and its anchors, and the drilling installation when on-site. Vessels are not permitted within the anti-collision zone without the permission of the Offshore Installation Manager (OIM). This zone will extend 50 m from the anchor pattern of the FPSO and 500 m from the drilling installation when using a DP system. It will be approximately 8.5 km² for the FPSO and 1 km² for drilling installations (Figure 2-11).

Communications regarding the safety zone and anti-collision zone will be sent out to mariners via the Canadian Coast Guard and through Navigational Warning (NAVWARN) and a Notice to Mariners. The coordinates will be provided to Canadian Hydrographic Services, NAFO, and One Ocean.

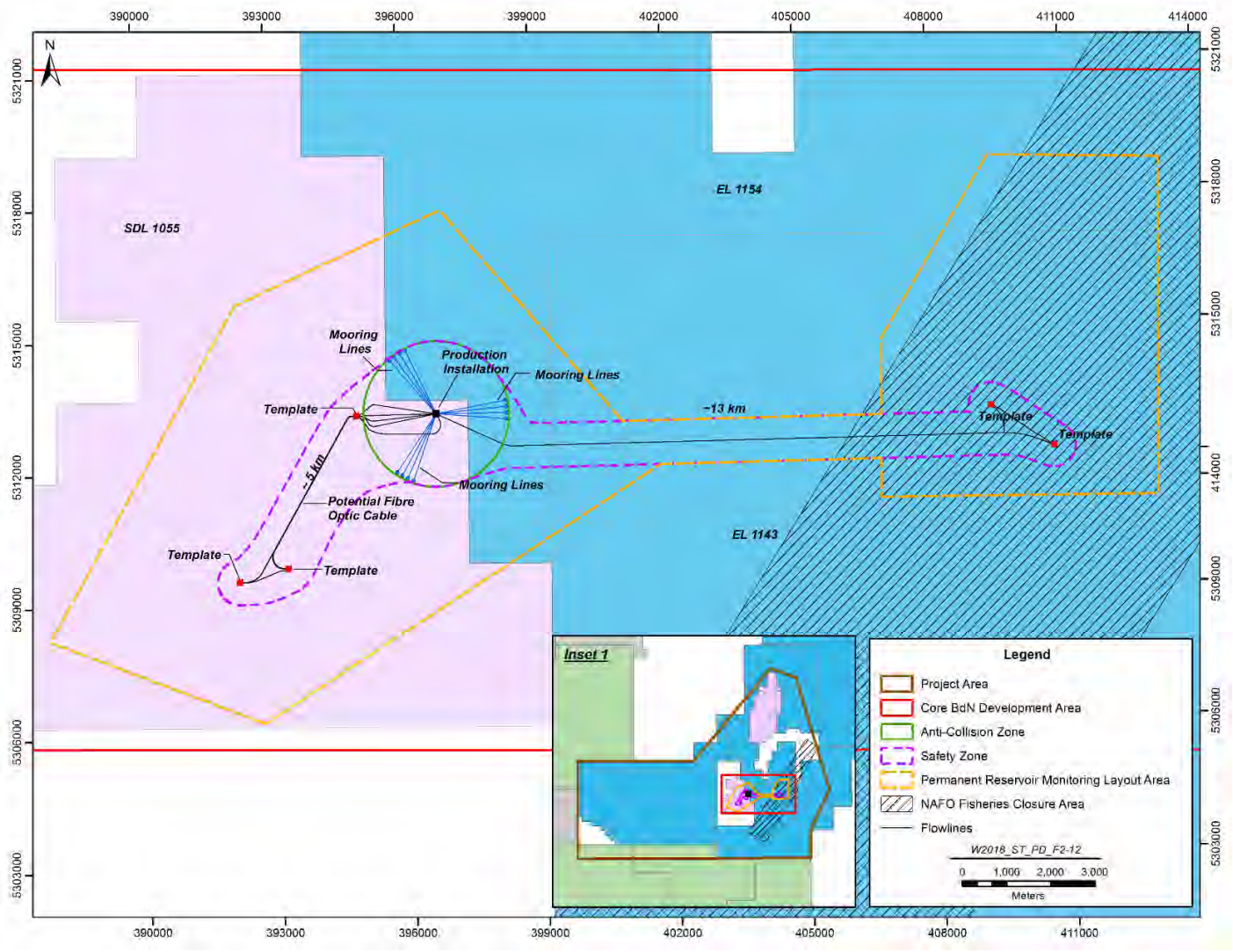


Figure 2-11 Proposed Project Conceptual Safety Zone and Anti-Collision Zone – Core BdN Development Area

2.5.3 Project Personnel

Professional, technical, and administrative staff will be required onshore in the Equinor Canada St. John's, NL office and offshore for the FPSO and drilling installation. The FPSO will be designed to accommodate a maximum of approximately 110 personnel. For drilling operations, the drilling installation contractor employs most of the personnel associated with a drilling program. Typically, between 120 to 160 persons may work on the drilling installation. Contractors will also be retained for specific work components, including but not limited to supply and operation of supply vessels, helicopter services, warehousing, and supply base support.

2.6 Project Phases and Activities

The Core BdN Development includes the offshore construction and installation and HUC, production and maintenance operations, drilling, and decommissioning. The Project includes all components and activities, including supporting activities, associated with offshore drilling and production operations such as geophysical surveys (e.g., VSP, 3D/4D, wellsite) vessel operations, ROV / AUV / video surveys, and, environmental and geotechnical surveys.

The Project may also include Project Area Tiebacks, which may include activities such as construction and installation of subsea infrastructure (well templates and flowlines tied-back to existing FPSO), drilling, geophysical surveys, geotechnical surveys, and/or environmental surveys.

Summary information on proposed Project activities are provided in the following subsections, with more detailed information provided in Section 2.6 of the EIS.

2.6.1 Offshore Construction and Installation, Hook-up and Commissioning

Offshore construction and installation and HUC may include:

- Pre-clearance surveys to determine the presence of seabed and/or subsurface obstructions prior to installation activities. Such surveys are similar to geotechnical, geophysical or well site surveys, and may involve the use of a remotely operated vehicle (ROV) and/or autonomous underwater vehicle (AUV) equipment.
- Installation of the subsea infrastructure, which may include well templates, flowlines, umbilicals, risers, moorings, and fibre optic cable. Well templates, riser bases, and moorings will be permanently positioned on the seafloor likely via suction pile driving. Flowlines, umbilicals, and cables will likely be laid directly on seafloor or laid via trenching.
- Protection of the subsea infrastructure which, if determined to be necessary, could include rock placement, concrete mattresses or trenching.

- Transit of the FPSO to the Project site via international shipping lanes and under its own power operating as a marine vessel (support vessels may be required). Detailed contingency planning and continuous weather forecasting will be undertaken during the move.
- Hook-up including tie-in and connection operations to connect flowlines and umbilicals between subsea templates, between templates and the FPSO, and connecting the moorings to the FPSO / turret. Flowlines will be flooded, and leak-testing will be performed.

Activities will be carried out by construction, pipelaying vessels, and activity-specific vessels, such as a diving support vessel. Offshore construction and installation activities will likely be carried out over three to five years, with site preparation and surveys in the first one to two years, which may be 'summer' seasons due to weather limitations associated with the offshore field season. HUC activities are estimated to last for four months or longer depending on operational and/or technical issues. These activities may occur at any time of the year.

2.6.2 Production and Maintenance Operations

The following describes the activities typically carried out during normal production and maintenance operations on an FPSO.

The topsides process facilities on the FPSO will separate the well fluids arriving from the reservoir into oil, water, and gas. Oil is the targeted commercial product and will be stored in the hull of the FPSO for subsequent transfer to shuttle tanker. As the pressure of the arriving fluids is reduced during the separation process, the gas will boil off, and will be collected for further use. There is no option to export natural gas from the Project Area to a commercial market, therefore, produced gas will be used on site. A relatively small portion will be used as fuel for power generation onboard the FPSO. The remaining gas volume (90 percent to 95 percent) will be re-compressed and reinjected into the reservoir for pressure support. No routine flaring of produced gas will take place. The produced water will be separated from the oil in separation vessels by means of the density difference between oil and water. After separation, the produced water is routed to the produced water treatment facilities for removal of sand and remaining oil content before discharge overboard as per the Offshore Waste Treatment Guidelines (OWTG) (National Energy Board [NEB] et al. 2010).

As pressure support will be needed in the reservoir to compensate for the pressure depletion taking place during production, water-alternating gas (WAG) injection wells are included in the design. Approximately 2.5 MSm³/d of gas from the crude oil separation process and approximately 32,000 m³/d of seawater will be injected into the reservoir for pressure support.

The water injection system may be combined with a process cooling system. Topsides process cooling will be based on direct seawater cooling, with return seawater being injected in the reservoir for pressure support. The volume of cooling water required may be between 20,000 m³/d to 80,000 m³/d and may be treated with biocides to prevent corrosion and the bacterial / marine growth. Excess cooling water not required for water injection will be discharged to the marine environment with the

produced water. Based on current design, the discharge is expected to be at approximately 15 m to 20 m depth, depending on ballasting.

The FPSO will use reciprocating dual fuel (gas / diesel) engines or dual-fuel turbines for power generation, with gas coming from the separation process (approximately 80 MSm³ gas annually). Diesel will be supplied via supply vessels on an as-needed basis (i.e., when fuel gas is off-spec or when the FPSO is not receiving well fluids). Up to 1,800 m³ to 2,400 m³ may be required annually.

FPSO equipment maintenance will include regularly scheduled shutdowns or turnarounds in line with established industry and company practice. Routine inspections of the subsea systems will also be conducted.

Ongoing Project design will investigate options to reduce flaring. There will be no routine flaring of produced gas from the FPSO. The produced gas not being used for power generation will be reinjected into the reservoir. During start up, shutdown, well clean-up activities, and during upset process conditions, depressurization may be required for safety reasons, and gas would be sent to the flare.

Potable water (up to 10 m³/d on average) will be produced from a desalination system onboard the FPSO.

Crude oil will be offloaded to shuttle tankers and shipped to an existing transshipment facility or directly to international markets. Cargo / fuel / chemical handling will occur as needed and follow established procedures and protocols depending on the nature of the substance being transported and handled.

2.6.3 Drilling Activities

The drilling of development wells includes the mobilization and operation of drilling installations, drilling and completion activities, wellbore clean-up and preparation, and well decommissioning or suspension. Commencing as early as 2024, a drilling installation will be mobilized to the Project location. Depending on the type of drilling installation selected (i.e., semi-submersible or drillship), it may be towed or self-propelled. For the Core BdN Development, the drilling installation will hold positioning via a DP system. In the larger Project Area, where water depths are shallower, the drilling installation may be anchored at location.

As described in Section 2.3, the Core BdN Development will involve the drilling of up to 40 wells, and Project Area Tiebacks could include the drilling of an additional 20 wells, with a combination of production and injection wells. Wells will either be drilled using templates (multiple wells drilled in one location) or at individual well locations (satellite wells). To enhance production ramp-up, pre-drilling of up to 10 wells (prior to FPSO hook-up) is being considered. It is estimated that drilling may occur in campaigns where a set number of wells would be drilled per campaign. The timeframe for the drilling campaign would depend on the number of wells to be drilled. For the Project, on average the total time for the drilling and completions of producers and injectors well types is approximately 45-85 days and less drilling time is required for pilot and sidetrack wells. To account for the total well number for the Core BdN Development (up to 40 wells) and Project Area Tiebacks (up to 20 wells)

drilling may occur at any time over the life of the Project but will not be continuous over the Project life.

As the Project is in the early stages of design, well design and locations have not been finalized. Once finalized, the well design will be submitted for approval to the C-NLOPB as required per the Operations Authorization (OA) requirements and the Approval to Drill a Well application process. It is estimated to take approximately 45 to 85 days to drill and complete a development well for the Project, depending on drilling and completion design, weather, technical requirements, and logistics. Satellite and or pilot wells would be drilled within a shorter timeframe.

Drilling can be divided into two stages – drilling with and without a riser. A riser is a large diameter tubular that connects the circulation system of the drilling installation to the wellhead, creating a closed loop for returns (e.g., fluids, cuttings and excess cement) as they are pumped down the well and returned back to the drilling installation for processing. Until the wellhead is installed, the riser cannot be installed.

The first section of a well is typically referred to as the conductor section. This section is drilled riserless with water-based mud (WBM), which consists primarily of seawater. WBM cuttings are discharged at the seafloor as they are circulated out of the hole. The next section, often referred to as the surface section, is also drilled riserless with returns to the seabed. Total WBM displaced is approximately 500 m^3. The wellhead is at the top of the surface casing string and extends approximately 1 m above the wellhead housing. Once the wellhead is installed, the blowout preventer (BOP) is placed below the string of riser and connected to the wellhead. The remaining sections of the well are drilled to predefined depths, typically using synthetic-based mud (SBM) as the drilling fluid, with casings installed as required per well design. SBM drill cuttings are discharged after treatment, below the sea surface at surface, from the drilling installation.

Drilling activities may also include batch drilling, which is the process of consecutively drilling the top hole sections for multiple wells. Batch drilling may reduce the overall duration of the drilling program, and therefore has the potential to have a positive effect on drilling timelines and schedule.

Once the well has reached the planned total depth (TD) and the target reservoir(s) is exposed, the well will be cleaned up to remove remaining cuttings within the wellbore and displaced with a compatible completion fluid. Once the well is completed, the subsea christmas tree (XT) and manifold are installed on the wellhead. The XT is an integral part of the well barrier system and houses all the valves and piping that connect the well to the subsea production system and to the FPSO.

2.6.4 Supply and Servicing

Offshore production activities are supported by various logistical activities, including existing onshore supply base and warehousing, offshore supply vessel (OSV), standby vessels (SBVs), and helicopters, and airports.

A supply base provides temporary storage, refueling, staging, and loading of materials and supplies to support offshore drilling and production activities. For the purposes of the EA, it is assumed that OSV traffic will be transiting from the port of St. John’s to the offshore location (in a straight-line

approach), as this is the only existing supply base capable of supplying all services to vessels (notably fuel supply). The number of estimated OSVs, including SBVs, and estimated monthly transits associated with each Project phase is outlined in Table 2.3. These numbers are estimates only and may change as Project design and operational plans are finalized. Note that the transshipment of oil is not include within the scope of the Project, as further discussed below.

Table 2.3 Estimated Vessels and Monthly Transits

Project Phase	Estimated # of Support Vessels	Estimated # of Transits per Month
Offshore construction and installation	1-2	4-8
HUC	2-3	4-8
Production and maintenance operations	2-3	4-8
Drilling	2-3	4-8
Potential Overlapping Activities		
HUC and drilling	3-6	4-16
Drilling and, production and maintenance operations	2-5	4-16
Project Area Tiebacks	2-5	4-16

Vessels to support Project activities will be contracted from third-party suppliers and will be required to have valid marine certification (i.e., certification of a supply vessel as a passenger vessel from Transport Canada) and meet regulatory requirements as set out by Canada and international organizations, as well as meeting Equinor Canada's global marine-vessel vetting requirements.

Helicopter support will be used for crew transfers and supplies to and from the Project and will be supplied by a third-party licensed operator under contract to Equinor Canada. It is estimated that up to 5 to 15 trips per week could be required during various Project phases. Aviation is regulated by Transport Canada, with the C-NLOPB also implementing specific operations requirements for helicopters when servicing offshore installations (e.g., lighting, hours of operation).

The base case for the Project is using shuttle tankers to offload crude from the FPSO and transport it to an existing transshipment facility; however, Equinor Canada may ship direct to international markets. Production operations offshore NL use the Basin Wide Terminal and Transshipment System, which is a fleet of modern double-hulled shuttle tankers that ships crude to an existing transshipment terminal in NL or direct to market. The preferred option is for Equinor Canada to use the tankers servicing offshore NL production operations. The frequency of shuttle tanker offloading is estimated as once per four to seven days at peak production. These shuttle tankers are operated by a third-party and once they leave the Project safety zone would be outside the care and control of the Project. The shuttle tankers are subject to international maritime requirements (i.e., International Maritime Organization (IMO)) and must adhere to the regulatory framework of the IMO as well as those of its flag state. This information is based on the current shuttle tanker fleet and may change over the potential 30-year temporal scope of the Project.

2.6.5 Supporting Surveys

Throughout the Project, activities and surveys may be required to support production and drilling activities. A more detailed description of each of these surveys can be found in Section 2.6.6 of the EIS.

- Geophysical / Geohazard / Wellsite and Seabed Surveys typically take between 5 to 21 days to complete but the overall duration can be longer depending on the data requirements and weather / operational delays. These surveys may occur at any time of the year over the temporal scope of the Project.
- 2D / 3D / 4D Surveys will take place within the Project Area. For 3D / 4D seismic surveys, the Project is considering permanent reservoir monitoring, where the ocean bottom cables (OBC) or ocean bottom nodes (OBN) are installed on the seafloor and removed at decommissioning, or conventional seismic using towed streamers or temporary OBNs. Permanent reservoir monitoring seismic surveys are estimated to take two weeks to complete and carried out twice per year. Conventional seismic surveys could be between two and four weeks and could occur once per year in early Project life, becoming less frequent in later years.
- Vertical Seismic Profiling (VSP) Surveys will be conducted as required throughout the Project life. It is estimated that one to two VSP surveys could be carried out for the Core BdN Development Area and they may be carried out at any time of the year.
- Environmental Surveys may occur throughout Project life at any time of the year using vessels of opportunity associated with the Project, typically taking between 5 to 21 days to complete.
- Geotechnical Surveys may occur throughout the Project life at any time of the year, using dedicated vessels provided by marine geotechnical specialist suppliers.
- ROV / AUV surveys will be conducted throughout the Project-life at any time of the year using vessels of opportunity associated with the Project.

Geophysical activities for the Project will be planned and conducted in consideration of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP, DFO 2007; and appended to the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2019)).

2.6.6 Project Area Tiebacks

The Core BdN Development could be expanded if through on ongoing internal assessments of known discoveries or through exploration / delineation activities that economically recoverable oil accumulation exists in fields within a threshold distance (approximately 40 km) of the FPSO (see Figure 2-12 for an illustration of what Project Area Tiebacks could look like).

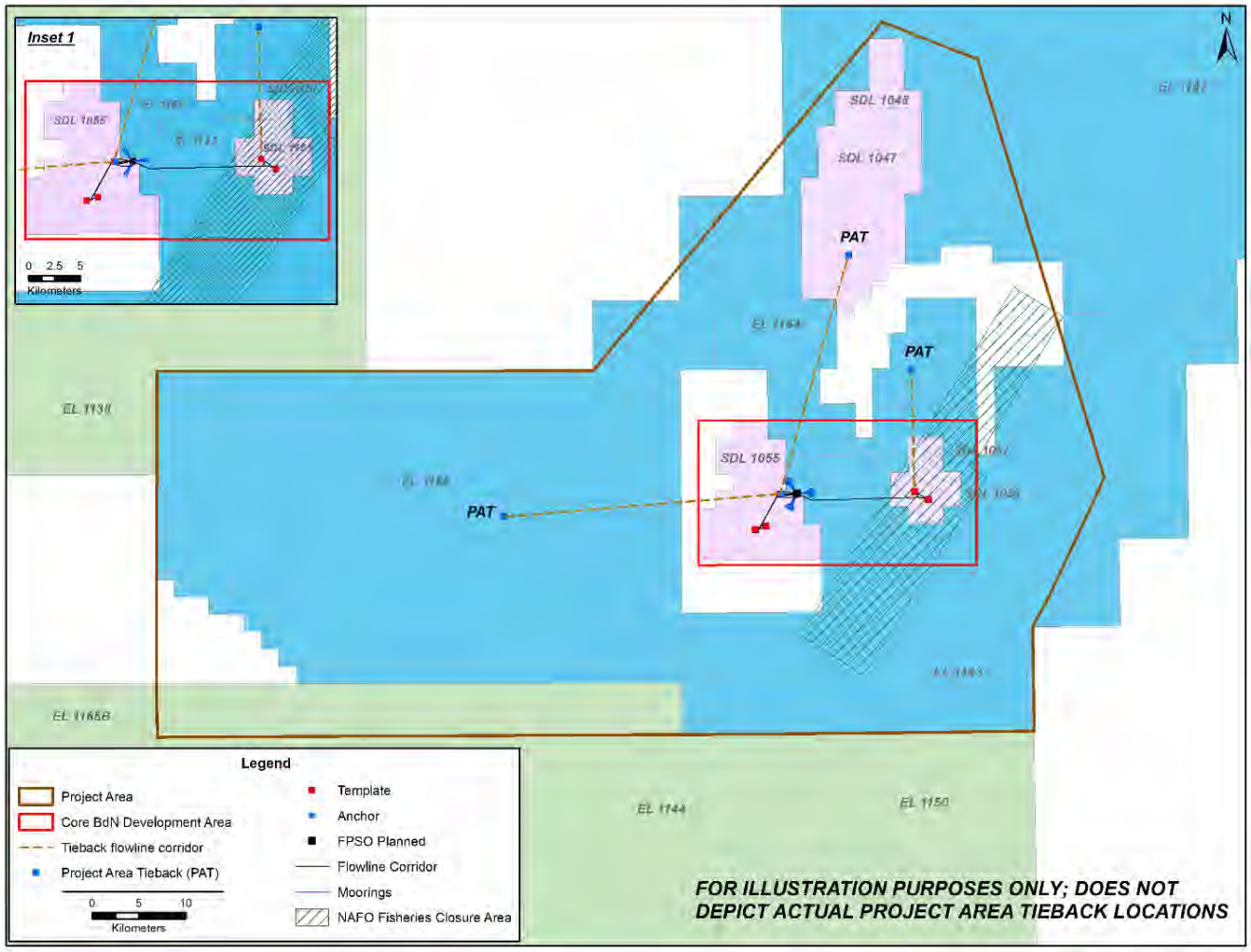


Figure 2-12 Illustration of Examples of Project Area Tiebacks in Project Area

The FPSO will be designed to accommodate these tiebacks. Activities associated with Project Area Tiebacks are the same as those described for the Core BdN Development and may include:

- Installation of subsea tieback(s) (well templates and flowlines)
- Continuation of production and maintenance operations from the existing production installation
- Drilling activities associated with the drilling of up to 20 additional wells (total) in well templates
- Continuation of supply and servicing
- Additional supporting surveys, if required
- Decommissioning

Should Project Area Tiebacks occur, all production would occur from the existing FPSO and would be extended out to the design life of the production installation and subsea infrastructure, which is 30 years. Therefore, the overall Project temporal scope is 30 years. Activities would occur year-round. Refer to Section 2.6.6 of the EIS for further information on Project Area Tiebacks.

2.6.7 Decommissioning

The end of field-life will either be at the end of the Core BdN Development (approximately 12-20 years) or up to 30 years with the addition of Project Area Tiebacks. At the end of field-life, Equinor Canada will decommission the Project in accordance with regulatory requirements in place at the time of decommissioning. It is anticipated that decommissioning will be carried out over multiple seasons, likely within a two- to four-year timeframe. Decommissioning of the FPSO may occur at anytime of the year.

As a base case, the FPSO will be decommissioned and removed from the Project location. All floating equipment (turret, mooring lines) will be removed. 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 protection measures (if required), they may have become fish habitat and the effects of removing them would have to be assessed.

A decommissioning plan will be developed and submitted for C-NLOPB review and approval as end of field life approaches. This plan will include options such as removal of flowlines and well templates or leaving subsea infrastructure in place. For the purposes of EA, effects assessments of both options were considered in the EIS, to the degree applicable.

Well abandonment will adhere to the requirements set out under the *Newfoundland Offshore Petroleum Drilling and Production Regulations*. Operators are required to provide detailed plans for monitoring suspended wells to the C-NLOPB and are also required to provide information regarding the suspension or abandonment methods to ensure the wells are adequately isolated, which in turn will prevent hydrocarbons from entering the environment.

The wellhead is typically removed during decommissioning. Removal of the wellhead, either by mechanical cutting inside the casing or using an external mechanical cutter, varies depending on water depth.

2.7 Waste Discharges and Emissions

The primary waste streams from the Project are categorized as follows:

- Air emissions
- Liquid wastes
- Drilling and completion waste
- Heat, light, and sound
- Hazardous and non-hazardous waste

The OWTG (NEB et al. 2010) provide performance targets for overboard discharges from production and drilling operations. In accordance with the OWTG and where applicable, discharges will be treated using best treatment practices that are commercially available and economically feasible before being released overboard. The Project's Environmental Protection Plan (EPP), as required by the OA, will provide details regarding the management of wastes, discharges and emissions for the Project. Chemicals used for drilling operations will be screened in accordance with Equinor Canada's chemical management and selection process that adheres to the Offshore Chemical Selection for Drilling and Production Activities on Frontier Lands (OCSG) (NEB et al. 2009). The chemical selection and management process will be included in the EPP.

2.7.1 Air Emissions

Air emission components associated with the Project, including criteria air contaminants (CACs) and greenhouse gas (GHG) emissions, are CO_2, nitrogen oxides (NO_X), sulphur oxides (SO_X), methane (CH_4), volatile organic compounds (VOCs), carbon monoxide (CO), nitrous oxide (N_2O), and particulate matter (PM). The main sources of air emissions are power generation at the FPSO, drilling and well operations, marine operations – offshore construction and installation, flaring, vessel transport, helicopters, and shuttle tankers.

As illustrated in Figure 2-13 and 2-14, the largest source of CO_2 emissions is associated with power generation on the FPSO, which contributes approximately 85 percent of the total CO_2 and GHG emissions over the lifetime of the field.

Fuel at the FPSO in normal operation is produced gas, while diesel is used at the drilling installation, marine construction and installation vessels, OSVs, and shuttle tankers. The relative contribution by the various emission source varies by air pollution component. Typically, diesel has higher emissions of NO_X and SO_X than produced gas. Further information on air emissions can be found in Section 2.8.1 of the EIS.

2.7.2 Liquid Wastes

The water management system for the FPSO will manage the following systems: potable water; produced water; cooling water; bilge and deck drainage water; ballast water; grey / black water (sewage); cooling water; and fire control water. For the drilling installation, the management system will be dependent on its configuration system, but will, at a minimum likely manage the following: potable water; bilge and deck drainage; ballast water; grey / black water; and fire control water. Liquid wastes will be generated on the FPSO, the drilling installation, and vessels involved, and will be treated using best treatment practices and managed in accordance with the OWTG (NEB et al. 2010). Refer to Section 2.8.2 of the EIS for further information.

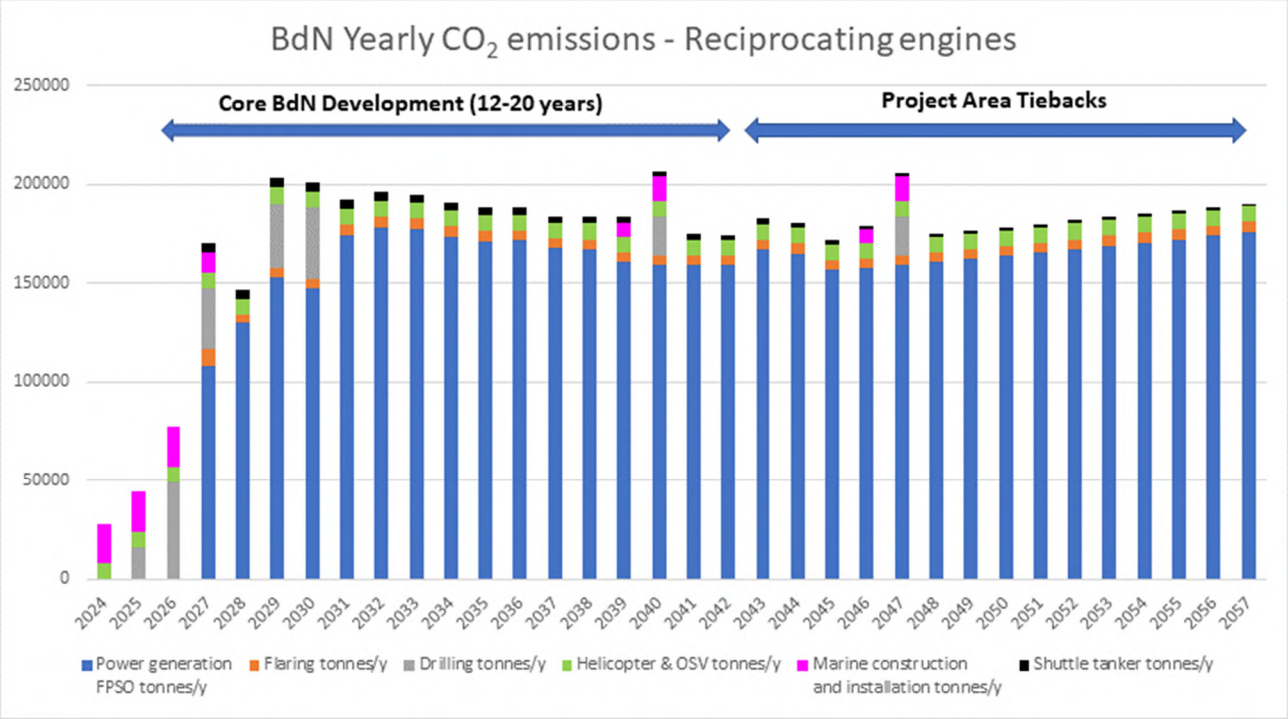


Figure 2-13 Lifetime Estimated CO_2 Emissions from the Project (based on preliminary design as of November 2018) – Reciprocating Engines Option

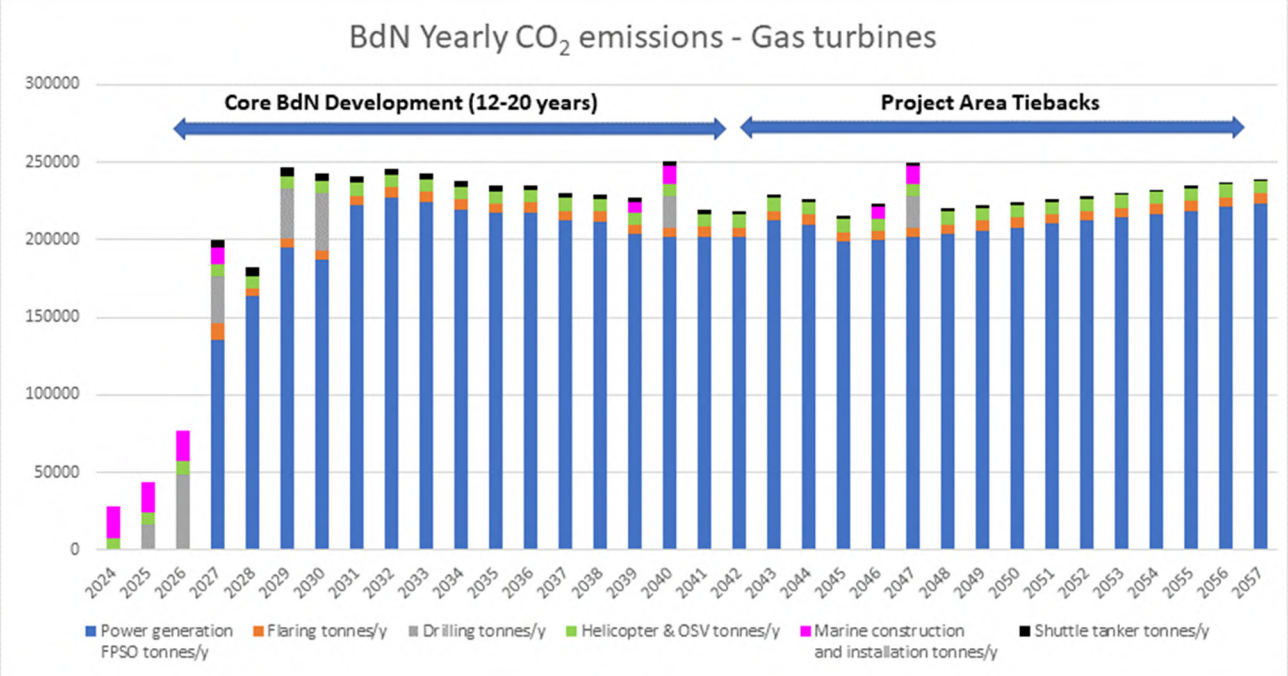


Figure 2-14 Lifetime Estimated CO_2 Emissions from the Project (based on preliminary design as of November 2018) – Gas Turbines Option

The primary liquid wastes associated with the operation of the FPSO are:

- Produced water, which will be treated to, at a minimum, meet the OWTG performance target and discharged to sea
- Excess cooling water, which will be co-mingled with the produced water prior to discharge. If biocides are used in the cooling water, they will be selected using Equinor Canada's chemical selection system and consistent with the OCSG (NEB et al. 2009) and discharged in accordance with the OWTG (NEB et al. 2010). The temperature of the combined discharge of cooling water and produced water will be approximately 35°C
- Produced sand, which will be discharged to sea if oil concentration is lower than 1 percent by weight on dry sand, or collected and shipped to shore for disposal at an approved waste management facility.

The primary waste associated with drilling and completing a well are:

- Drill mud and cuttings, which will be managed in accordance with the OWTG (NEB et al. 2010). WBM cuttings associated with riserless drilling will be discharged at depth. The drilling installation will be equipped with solids control equipment to treat SBM cuttings prior to discharge. Excess or spent SBM that can no longer be used is sent to shore for disposal at an approved waste management facility.
- Completion fluids, which are likely be a brine fluid with low solids, or an oil-based fluid, which contains small quantities of chemicals to protect the well. These chemicals may include a corrosion inhibitor, an oxygen scavenger, and a biocide. Similar to drilling fluids, the completion fluid may also consist of a synthetic-based fluid rather than the brine. It is estimated that completion fluid volumes may range from 40 m^3 to 160 m^3 per well.
- Cement, which may be discharged to the sea floor as hardened cement particles during riserless drilling or treated similar to drill cuttings when the riser is installed. Water and residual cement slurry will be discharged following cleaning operations of the cement unit.
- BOP testing fluid, which typically consists of fresh water and a solution of water-based ethanediol and glycol. BOP fluids are screened for acceptability prior to use.

2.7.3 Heat, Light, and Sound Emissions

Heat will be generated primarily through power generation and exhaust from the FPSO and drilling installation, and non-routine / safety flaring from the FPSO. With the use of the waste heat recovery unit (WHRU) on the FPSO, heat emissions will be reduced.

Light emissions will be generated at night from deck lighting on the FPSO, the drilling installation, and vessels and when non-routine / safety flaring is required. Equinor Canada is investigating options to reduce light emissions from the FPSO.

Sound will be generated underwater during regular production and drilling operations, vessel operations, and geophysical surveys. The level of sound will be dependent on the final design of the FPSO, the drilling installation used, and vessels contracted to support the Project. The extent to which sound travels is determined by water depth, salinity, and temperature. Underwater sound generated during production operations are continuous, whereas sound from a 4D seismic program

is impulse sound and emitted over a shorter period of time. Sound attenuation modelling was undertaken to assist with the effects assessment and is further discussed in Chapter 9 and 11 of the EIS.

Atmospheric sound is not of concern for the Project given the anticipated low levels of atmospheric sound emissions, the limited transmission of underwater sound above the surface, and location of receptors. Helicopter traffic will generate atmospheric sound at the airport, in transit, and at the FPSO and/or drilling installation. However, with the use of the existing St. John's International Airport, potential effects on human receptors is reduced. Helicopters are required to avoid important bird areas, so potential interactions with birds are reduced. Given the distance from the Project Area to shore (approximately 500 km) and occupational and safety requirements on the drilling installation, there will be no likely interaction with human receptors.

2.7.4 Hazardous and Non-hazardous Wastes

Equinor Canada's EPP will include plans for the management of waste material for the Project. Hazardous wastes generated during the Project, including dangerous goods, will be stored in designated areas in appropriate containers / containment for transport to shore in compliance with the *Transportation of Dangerous Goods Act* and its regulations. Applicable approvals for the transportation, handling, and temporary storage of these hazardous wastes will be obtained as required. Biomedical waste will be collected onboard by health professionals and stored in special containers before being sent to land for incineration. Non-hazardous wastes generated during the Project that are not allowed to be disposed overboard will be stored in appropriate containers onboard and transported back to shore. Hazardous and non-hazardous wastes shipped to shore for disposal will be collected onshore by a third-party contractor for disposal of the waste at an approved facility and in compliance with federal and provincial regulations and requirements.

For the FPSO and drilling installation, hazardous wastes that require management may include oily wastes (e.g., filters, rags and waste oil), waste chemicals and containers, batteries, and spent drilling fluids. Non-hazardous wastes may include domestic wastes, packaging material, scrap metal, and other recyclables such as waste plastic.

The occurrence of naturally occurring radioactive material (NORM) in volumes of any significance is not anticipated. If NORM encountered, appropriate waste handling and management will be implemented.

2.8 Summary of Changes to the Project

Since the Project Description (Equinor Canada 2018) was submitted in June 2018, there have been some changes to the Project scope, due to progress with Project design, and are as follows:

- Well count – number of wells for the Core BdN Development is estimated to be 10 to 40 wells; Project Description listed 10 to 30 wells.
- Number of subsea well templates – the Project Description stated 5 to 10 well templates, this has changed to 3 to 10 well templates.
- Permanent reservoir monitoring or conventional 4D seismic was not considered an option at the time the Project Description was submitted. It is included as an option and included in the effects assessment, as applicable.

2.9 Environmental Planning and Management

Equinor Canada has a clear goal to facilitate sustainable development and is committed to reducing environmental effects. Equinor Canada will implement and adhere to relevant environmental mitigation requirements outlined in applicable legislation and regulations, including those committed to in the EIS, and eventually required as enforceable conditions of an EA approval. This will include requiring its contactors and subcontractors to implement and adhere to those mitigation measures and compliance standards that apply to their specific work scopes.

Equinor Canada operates in a manner that protects people, the environment, communities, and material assets. Equinor Canada contributes to sustainable development through core activities wherever they work. They use natural resources efficiently and provide energy that supports sustainable development. The Equinor Canada management system defines how they work and describes how they lead and perform activities. Commitment to and compliance with their management system are a requirement.

As part of its project planning and as a requirement of the C-NLOPB Operations Authorization (OA) process, Equinor Canada will submit the following documents to the C-NLOPB:

- Safety Plan
- EPP, which may include:
  - Environmental Effects Monitoring Plan
  - List of environmentally critical components
  - Summary of environmental risk and prevention measures
  - Chemical management and selection procedures
  - Environmental compliance monitoring procedures
- Demonstration of financial obligations, including a compensation plan respecting damages related to offshore activity
- Flaring and Venting Plan
- Oil Spill Response Plan (OSRP)

- Emergency Response Plan
- Spill Impact Mitigation Analysis (SIMA) (previously referred to as Net Environmental Benefit Analysis)

The consideration of environmental issues from the earliest stages of Project planning and design and throughout eventual implementation is an integral and fully integrated part of Equinor Canada's approach to its petroleum development programs and other activities.

As illustrated throughout this EIS, potential environmental issues and interactions that may be associated with the Project can be avoided or reduced through the use of thorough planning and sound operational practices and procedures, supported by standard mitigation measures that are well established and outlined in relevant regulatory procedures and guidelines, and which have been routinely and effectively applied to similar offshore development programs carried out in the Canada-NL offshore area and internationally for decades.

In planning and designing the Project and throughout the course of the EA, including the environmental effects analysis and the identification of mitigation included in the EIS, Equinor Canada has applied a precautionary approach to assessing and attempting to avoid or reduce adverse environmental effects.

Equinor Canada will obtain the required permits, approvals and authorizations for the Project, and the company and its contractors will comply with these and relevant regulations and guidelines in planning and implementing the Project. This includes the various mitigation measures identified and committed to in the EIS, the implementation and effectiveness of which will be directed, managed and monitored in accordance with Equinor Canada's applicable policies and procedures.

3.0 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

CEAA 2012 requires that every EA of a designated project consider alternative means of carrying out a project that are considered technically and economically feasible and the environmental effects of any such alternative means. As part of the EA for this Project, alterative means were considered for select Project aspects, including production installation and subsea infrastructure, drilling installation, and seismic surveys. The process for consideration of alternative means of carrying out the Project included:

- Identification of alternative means of carrying out the Project
- Consideration of the environmental effects of alternative means that are deemed to be technically and economically feasible
- Selection of the preferred alternative means of carrying out the Project, based on the relative consideration of effect
- Assessment of environmental effects of the preferred alternative

If an option was not considered to be technically feasible (i.e., available in the market and proven for use in a similar operating environment), no further assessment was undertaken. Economic feasibility included consideration of capital, and direct and indirect operational expenditures.

The Project is in the early stages of design, which means that Project design and operational aspects are still under review. A full description of the alternative means assessed is available in Section 2.7 of the EIS. A summary is provided in Table 3.1 below.

Table 3.1 Summary of Alternative Analysis for the Project

Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
Comparison of Power Generation with Reciprocating Engines and Gas Turbine					
Reciprocating engines	YES	UNCERTAIN	YES	Higher energy conversion efficiency than gas turbines Lower GHG emissions	Under investigation
Gas turbine	YES	YES	YES	Slightly larger GHG footprint than reciprocating engines Larger waste heat recovery (WHR) potential than reciprocating engines	Under investigation

Table 3.1 Summary of Alternative Analysis for the Project

Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
Evaluation of Energy Efficiency Measures					
Variable speed drive (VSD) on gas compressors	YES	YES	YES	Reduced environmental footprint	Under investigation
VSD on water injection pumps	YES	YES	YES	Reduced environmental footprint	Under investigation
WHRU on all power generating engines/turbine	YES	YES	YES	Reduced environmental footprint	Under investigation
No WHRU, all heat provided by gas fired heaters	YES	YES	YES	Increased CO_2 emissions	✗
Comparison of Flare Gas Recovery Options					
Low pressure (LP) flare gas burning	YES	YES	YES	Increase in GHG emissions, larger environmental footprint than alternatives	✗
LP flare gas recovery, pilot flare	YES	YES	YES Increased overall costs	Minor air emissions from pilot flare in normal operations	✓
LP flare gas recovery, pilotless design	YES	YES	UNCERTAIN Increased costs compared to pilot flare	No emissions to air in normal operation	Under investigation
Produced Water Management Alternatives					
3-stage treatment and discharge to sea	YES	YES	YES	Discharge of treated produced water containing residual oil	✓
Produced water reinjection to disposal formation	YES	NO	N/A – Not technically feasible due to absence of suitable geologic formations		
Produced water reinjection with the seawater injection	YES	NO	N/A – Not technically feasible		

Table 3.1 Summary of Alternative Analysis for the Project

Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
Comparison of Lighting Options					
Spectral modified lighting	YES	NO	N/A – Not technically feasible		
Reduced/no lighting for periods of time	UNCERTAIN	UNCERTAIN	YES	May reduce attraction	Under investigation
Multiple sets of lighting with varying intensity/characteristics, e.g. reduced lighting, emergency lighting, etc.	UNCERTAIN	UNCERTAIN	UNCERTAIN	May reduce attraction	Under investigation
Direction shielded lighting	YES	YES	YES Increased cost	May reduce attraction	Under investigation
LP flare gas recovery	YES	YES	YES Increased cost	May reduce attraction	✓
LP flare gas recovery, pilotless design	YES	YES	YES Increased cost	May reduce attraction	Under investigation
Subsea Flowline Protection Options					
No protection	YES	YES	YES	Potential damage to flowlines by dropped objects or other interference	Under investigation
Trenching	YES	Uncertain; additional information on seabed properties required	UNCERTAIN	Potential interference/effects on fish habitat	Under investigation
Rock Protection	YES	YES	YES	Potential interference/effects on fish habitat Potential creation of fish habitat	Under investigation
Concrete Mattresses	YES	YES	YES	Potential interference/effects on fish habitat Potential creation of fish habitat	Under investigation

Table 3.1 Summary of Alternative Analysis for the Project

Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
Comparison of Drilling Installation Options					
Semi-submersible	YES	YES	YES	Both semi-submersible and drillship options considered acceptable assuming appropriate controls are implemented	✓
Drillship	YES	YES	YES		
Jack-up	YES	NO	N/A - Not technically feasible		
Comparison of Water-based and Synthetic-based Drilling Muds					
WBM	YES Use and management in accordance with OWTG and OCSG	NO Technically inferior in deeper sections of well	NO Potential economic increases if used in deeper sections of well	WBM acceptable for upper hole sections; SBM acceptable for lower well sections. For both options, it is assumed appropriate controls are implemented and OCSG is followed. Both options considered in assessment of potential environmental effects	✓ Use of WBM for upper well sections when drilling without riser installed
SBM	YES	YES Technically superior for deeper sections of well	YES		✓ SBM to be used at lower well sections with riser installed.
Comparison of Drilling Waste Disposal Options					
WBM - Disposal at Sea	YES	YES Will only be used during riserless drilling; therefore, cannot be returned to drilling installation for collection	N/A	Localized effects on seafloor	✓ Disposal at sea during riserless drilling

Table 3.1 Summary of Alternative Analysis for the Project

Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
WBM - Disposal on shore	YES	NO Will only be used during riserless drilling; therefore, cannot be returned to drilling installation for collection	N/A - Not technically feasible		
WBM - Offshore reinjection	YES	NO	N/A - Not technically feasible		
SBM - Disposal at Sea	YES	YES	YES	Localized effects on seafloor	✓
SBM - Disposal on shore	YES	YES	NO Increased costs due to increased transportation and operational delays	Increase in GHG emissions, larger environmental footprint	✗
Offshore reinjection	YES	NO	N/A - Not technically feasible		
4D Seismic Survey Options					
Permanent reservoir monitoring	YES	YES	Likely higher cost than conventional seismic but better field data may improve resource recovery	More frequent surveys; seabed interference	Under investigation
Conventional seismic – temporary ocean bottom nodes (OBNs)	YES	YES	Likely higher cost than conventional seismic but better field data may improve resource recovery	More frequent surveys, seabed interference	Under investigation

Table 3.1 Summary of Alternative Analysis for the Project

Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
Conventional seismic – towed streamers	YES	YES	YES, but data quality is lower than in fixed seismic	Less frequent; no seabed interference	Under investigation

With respect to chemical selection, the Project is in the early stages of project design and information regarding chemicals for production and/or drilling activities are yet to be determined. However, in terms of chemical selection, Equinor has established chemical selection and management processes, which will be used during project design, crude processing planning, and well planning and design. The chemical selection and management process is aligned with the OCSG (NEB et al. 2009), and other regulatory requirements to enable the selection of chemicals that, once discharged at sea, would have the least effect on the receiving environment.

4.0 REGULATORY AND STAKEHOLDER ENGAGEMENT

Engagement is a key component of Equinor Canada's approach to the planning and implementation of its oil and gas projects and other business activities. Engagement initiatives have been undertaken in relation to the Project and the EIS, with further engagement in progress or being planned. This includes discussions with relevant government departments and agencies, Indigenous groups and stakeholder organizations.

Consultation and engagement are also an important requirement of the EIS Guidelines, and these requirements have guided Equinor Canada's approach to consultation for this Project. The following sections summarize the results of consultations with departments, agencies, and stakeholder organizations. Section 5 summarizes the results of engagement with Indigenous groups.

Table 4.1 summarizes the stakeholders engaged with respect to this Project to date. Refer to Sections 3.2 and 3.4 of the EIS for further details.

Table 4.1 Summary of Stakeholders Engaged to Date for the Project

Stakeholder Group	Organization
Government Agencies / Departments	• CEA Agency • C-NLOPB • DFO • Environment and Climate Change Canada (ECCC) • Health Canada • Natural Resources Canada (NRCan) • Transport Canada
Fisheries	• Fish, Food and Allied Workers-Unifor (FFAW-Unifor) • Ocean Choice International (OCI) • Association of Seafood Producers (ASP) • Groundfish Enterprise Allocation Council (GEAC) • One Ocean
Other Interest Groups	• Nature Newfoundland and Labrador (Nature NL) • World Wildlife Fund (WWF) • Canadian Parks and Wilderness Society (CPAWS) • Protected Areas Association of Newfoundland (PAAN) • Sierra Club NL Chapter

4.1 Government Department and Agencies

Equinor Canada recognizes that federal and provincial government departments and agencies have specific responsibilities or interests, associated with their respective mandates and legislative requirements, related to the Project and its potential environmental effects. In planning and developing the EIS, Equinor Canada engaged with regulatory agencies to share information on the Project, obtain relevant environmental baseline information for the EIS and identify potential concerns. Engagement initiatives with government departments and agencies have included discussions and ongoing information sharing through various means (such as through letters, email, telephone conversations). The results of these initiatives have also been considered in the scope and content of the EIS as applicable.

4.2 Stakeholder Consultation Activities

As part of the EIS preparation, Equinor Canada has also engaged with key stakeholders and environmental non-government organizations (ENGOs) that have traditionally been engaged in or expressed an interest in offshore oil and gas operations in NL and their potential effects. The groups consulted for this Project are listed in Table 4.1. An inventory of Project-related engagement initiatives is provided in Section 3.4 of the EIS. These stakeholder engagement activities have included discussions and ongoing information sharing through various means (e.g., letters, emails, telephone conversations), the results of which have also been considered in the scope and content of the EIS, as applicable. A summary of the key questions and issues raised through these engagement activities is provided in Table 4.2.

Table 4.2 Key Issues and Questions Raised by Stakeholder Organizations

Key Questions and Issues Raised	Where Addressed in the EIS
Marine Fish and Fish Habitat	Chapter 9
Potential changes to dissolved oxygen concentrations associated with drill cuttings, and whether it will be measured during environmental effects monitoring (EEM)	Section 9.6
Marine and Migratory Birds	Chapter 10
Marine Mammals	Chapter 11
EEM	Chapter 9, 10, 11
Commercial fisheries	Chapter 13
Cumulative effects	Chapter 15
Accidental events	Chapter 16
Use of dispersants	Chapter 16

5.0 INDIGENOUS ENGAGEMENT

Equinor Canada is committed to conducting its business in a manner that promotes sustainable development by reducing harm to the environment, contributing to local communities, respecting human and Indigenous rights and adhering to openness and transparency in its operations. As part of this commitment, Equinor Canada respects the asserted and established Aboriginal and Treaty Rights of Indigenous peoples in Canada as protected by section 35 of the *Constitution Act, 1982* and acknowledges that its activities may have potential impacts on these rights. Consistent with its corporate values (Courageous, Open, Collaborative and Caring), Equinor Canada is committed to informing and meaningfully engaging Indigenous groups whose rights or interests may potentially be affected by its operations of the company's ongoing and planned activities.

Table 5.1 lists those Indigenous groups that may potentially be affected by the Project as identified in the EIS Guidelines.

Table 5.1 Indigenous Groups Potentially Affected by the Project (as identified in the EIS Guidelines)

Province	Indigenous Groups
NL	• Labrador Inuit (Nunatsiavut Government) • Labrador Innu (Innu Nation) • NunatuKavut Community Council (NCC)
Nova Scotia	• Eleven Mi'kmaq First Nation groups represented by Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO): – 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 – Waycobah First Nation • Millbrook First Nation • Sipekne'katik First Nation
New Brunswick	• Eight Mi'gmaq First Nations groups represented by Mi'gmawe'l Tplu'taqnn Inc. (MTI): – 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 • Elsipogtog First Nation

Table 5.1 Indigenous Groups Potentially Affected by the Project (as identified in the EIS Guidelines)

Province	Indigenous Groups
New Brunswick	• Five Maliseet First Nation groups represented by the Wolastoqey Nation in New Brunswick (WNNB): – Kingsclear First Nation – Madawaska Maliseet First Nation – Oromocto First Nation – Saint Mary's First Nation – Tobique First Nation • Woodstock First Nation • Peskotomuhkati Nation at Skutik (Passamaquoddy)
Prince Edward Island	• Two Mi'kmaq First Nation communities represented by the Mi'kmaq Confederacy of Prince Edward Island (MCPEI): – Abegweit First Nation – Lennox Island First Nation
Quebec	• Three Mi'gmaq First Nation groups represented by the Mi'gmawei Mawiomi Secretariat (MMS): – Micmas of Gesgapegiag – La Nation Micmac de Gespeg – Listuguj Mi'gmaq Government • Les Innus de Ekuanitshit • Première Nation des Innus de Nutashkuan

In addition to the groups listed above, the EIS Guidelines also direct Equinor Canada to engage with Miawpukek First Nation (MFN) and Qalipu Mi'kmaq First Nation (QMFN) Band for purposes of good governance to discuss the potential effects of the Project as described under paragraph 5(1)(c) of CEAA 2012. Equinor Canada has engaged with all the named groups and, while not required to do so by the EIS Guidelines, in response to community requests has also provided Project-related information to Mekap'sk Mi'kmaq Band as well as to the Passamaquoddy of Maine (Pleasant Point and Indian Township).

5.1 Approach to Engagement

Consistent with the EIS Guidelines, Equinor Canada's engagement activities have been directed at establishing open, meaningful communication and information exchange through continuing dialogue with the various Indigenous groups. Equinor Canada has attempted to provide Indigenous groups with opportunities both to learn about the Project, including its location, design, potential effects and proposed mitigation measures, and to provide input respecting the potential effects of the Project upon Indigenous rights and interests. To this end, Equinor Canada has provided relevant Project-related information in an ongoing, timely, accessible and culturally appropriate manner to each Indigenous group or representative organization as appropriate in order to:

- Enhance its understanding of how these groups may potentially be affected by Project activities
- Listen and respond to questions and concerns raised by the groups

- Work with groups to identify and develop potential measures to avoid or mitigate adverse effects, if any, upon asserted or established Indigenous rights and the interests referred to in CEAA 2012 section 5(1)(c)

As the EIS Guidelines require Equinor Canada to engage with a wide range of Indigenous groups located throughout the Atlantic region and characterized by distinct languages, histories and cultures, the approach to engagement, including the timing and nature of specific engagement activities, has been developed, where possible, through discussion and agreement with each of the groups.

5.2 Engagement Activities

While the intensity of engagement has varied in accordance with the preferences of groups, the engagement process has been based upon consistent and regular contact and information exchange designed to enable each group or representative organization to understand the Project and identify potential impacts upon their communities, activities and asserted or established Indigenous rights. Engagement activities have included the ongoing provision of Project update information and the EA process through e-mails or phone calls. Equinor Canada has met or offered to meet in person or by conference call with each community or representative organization and has provided relevant information in the form of Project summaries, explanatory maps and graphics, and PowerPoint presentations related to Equinor Canada, the Project and applicable regulatory processes, translated as necessary.

In addition to individual meetings with various groups, Equinor Canada held three half-day workshops (in St. John's, Quebec City and Moncton) in October 2018 with the various groups to discuss potential environmental effects and proposed mitigation measures.

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 acceptance 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 of the EIS), summarizing publicly available information relating to Indigenous Knowledge. The Study also used information contained in an Indigenous Knowledge study by MTI, prepared in the context of the Flemish Pass Exploration Drilling Program EIS, which was prepared in 2017 by Equinor Canada (then Statoil).

Equinor Canada has kept detailed records of its engagement activities, logging interactions with, and documenting the issues raised by, each Indigenous group. These records have been shared and discussed with the CEA Agency (now the IAAC) on a regular basis. Refer to Section 3.3 of the EIS for more details.

Equinor Canada will continue to provide opportunities for information-sharing and exchange in the post-EIS submission period. The specific nature, frequency, subject matter and format of such future engagement will be determined through discussion with the various Indigenous groups. Equinor Canada will continue to engage with all groups identified above so that information is provided and that Indigenous groups can express concerns and identify interests.

5.3 Summary of Issues Raised

Feedback obtained during this phase of engagement has been incorporated into the EIS as applicable and appropriate, and the EIS documents concerns and priorities raised and demonstrates how these have influenced Project planning and/or been considered in the EIS. A summary of key issues and questions raised by each Indigenous group, and corresponding sections in the EIS are provided in Table 5.2. Equinor Canada's detailed responses to the issues and questions raised are found in Table 3.3 of the EIS.

Table 5.2 Key Issues and Questions Raised by Indigenous Groups

Indigenous Group	Key Issues and Questions Raised	EIS Reference
Nunatsiavut Government	Project Schedule – questions concerning timing of key Project activities	• Section 2.1.1
	Treatment of Discharges (Produced Water) and potential impacts on fish and fish habitat	• Section 2.7.1.5 • Section 9.3.2.4 • Section 9.4.2.2 • Section 9.2.3.2 • Section 9.2.3.3
	Accidents and Malfunctions (spill modelling) – information about possible spill trajectory and spill response	• Section 16.1 • Section 16.4.3 • Section 16.4.4 • Section 16.7.3
	Impact of Project on subsistence and commercial fish species	• Section 9.5.5 • Section 9.5.6 • Section 13.1.5 • Section 13.2 • Section 13.4 • Section 13.5 • Section 14.1.5 • Section 14.1.5.1 • Section 14.1.5.2
Innu Nation	Need for Ongoing Engagement (Information exchange)	• Section 3.3 • Section 3.3.1 • Section 18.3 • Section 18.4.1 • Section 18.4.2 • Section 18.5.1
	Publication of Monitoring Reports	• Section 18.4
	Accidents and Malfunctions – ecosystem impacts	• Section 16.7
	Spill Modelling methodology	• Section 16.4
NCC	Accidents – potential impacts of spills on ecosystem	• Section 16.7
	Project Description – relationship to exploration Drilling	• Section 2.1 • Section 2.2 • Section 2.3 • Section 2.6.6
	Engagement with Indigenous Groups	• Section 3.3 • Section 3.3.1 • Section 18.3 • Section 18.4.1 • Section 18.4.3 • Section 18.5.1
	Economic Opportunities associated with Project	Not within the scope of the EIS Guidelines

Table 5.2 Key Issues and Questions Raised by Indigenous Groups

Indigenous Group	Key Issues and Questions Raised	EIS Reference
MFN	Equinor's Corporate Structure, Experience and Policies	• Section 1.1
	Project Concept and Design – footprint, number of wells, oil transport, safety zone, tiebacks, spill response plan, flowlines and pipelines	• Section 2.5
	Impact on Commercial and Food, Social or Ceremonial (FSC) fisheries	• Section 7.3.8 • Section 9.5.5 • Section 9.5.6 • Section 13.1.5 • Section 13.2 • Section 13.4 • Section 13.5 • Section 14.1.5.1 • Section 14.1.5.2
	Vessel Traffic – noise and discharges and impact on salmon	• Section 9.3.5.3 • Section 9.4.5.1
	Spills – treatment and response	• Section 16.1
	Sound – effects on marine life	• Section 9.3.2.3 • Section 9.3.3.3 • Section 9.3.4.1 • Section 9.3.5.4 • Section 10.3.1.1 • Section 10.3.5.1 • Section 10.4.5 • Section 11.3.1.1 • Section 11.3.2.1 • Section 11.3.3.1 • Section 11.3.4 • Section 18.3 • Section 18.4.2 • Section 18.5.1 • Section 9.4.1.3 • Section 9.4.3.3 • Section 9.4.4.1 • Section 9.4.5.1 • Section 11.3.5 • Section 11.4.2.1 • Section 11.4.3.1 • Section 11.4.4.1 • Section 11.4.5
	Community Investment	Not within the scope of the EIS
	Safety and Environment – compliance with regulatory standards	• Section 1.3.2.2 • Section 1.3.4
	Future Indigenous Engagement	• Section 14.1.5.3 • Section 14.5
	Incorporation of Indigenous Knowledge	• Section 14.1.4 • Section 14.1.5.2 • Appendix H
	Impact of Project on Indigenous Rights	• Section 14.1.5.1 • Section 14.4.2 • Section 14.1.5.2

Table 5.2 Key Issues and Questions Raised by Indigenous Groups

Indigenous Group	Key Issues and Questions Raised	EIS Reference
QMFN Band	Environmental Effects Monitoring (scope)	• Section 18.4
	Cumulative Effects on marine ecosystem	• 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)	• Section 9.5.5 • Section 9.5.6 • Section 14.1.5.1 • Section 14.1.5.2
	Lack of capacity - funding	Not within the scope of the EIS
	Project design and components	• Section 1.2.2 • Section 2.5 • Appendix A.3
KMKNO	Environmental Effects Monitoring – form, scope and frequency	• Section 18.4
	Cumulative Effects	• 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	• Section 1.1
	Environmental Effects – Ballast water and introduction of invasive species through ballast water	• Section 2.8.2 • Section 9.3.4.1 • Section 9.4.4.1
	Decommissioning – removal of seabed infrastructure and impact on habitat	• Section 9.3.6 • Section 9.4.6
	Spills – effects on biophysical environment and human health	• Section 16.7
	Commercial-communal fisheries, including effects on commercial species (snow crab) and compensation for losses	• Section 7.3.8.1 • Section 13.1.5.1 • Section 13.2.4.2 • Section 14.1.5.2 • Section 16.7.8 • Section 16.7.9
	Ongoing information sharing with Indigenous groups	• Section 14.1.5.3 • Section 14.5
Millbrook First Nation	None identified to Proponent	
Sipekne'katik First Nation	None identified to Proponent	
MTI	Marine Protected Areas and potential interaction with the Project	• Section 6.4.2.2 • Section 12.2 • Section 16.7.7 • Section 12.3
	Marine Mammals – potential impacts on right whales, with emphasis on ship strikes	• Section 11.5.3 • Section 11.1.5.1 • Section 11.3.1.1 • Section 11.3.4.1 • Section 11.3.5.1 • Section 11.4.5.1
	Fish and Fish Habitat – potential impact on salmon migrating through / overwintering in Project Area	• Section 9.5.5 • Section 14.1.5.1 • Section 14.1.5.2 • Section 16.7.4

Table 5.2 Key Issues and Questions Raised by Indigenous Groups

Indigenous Group	Key Issues and Questions Raised	EIS Reference
MTI	Environmental Effects Monitoring – scope and nature	• Section 18.4
	Indigenous Engagement	• Section 14.1.5.3 • Section 14.5
	Decommissioning – seabed infrastructure	• Section 9.3.6 • Section 9.4.6
	Effects of Environment on Project – disconnection in rough weather	• Section 17.3.2
	Produced Water – level of hydrocarbons and dispersion area	• Section 9.3.2.4 • Appendix J • Section 9.4.2.1
	Emergency Response – budget, procedures, minimum requirements	• Section 1.3 • Appendix P • Section 16.1 • Appendix Q
	Indigenous groups – Sami in Norway and role in management of salmon resources	Not within the scope of the EIS Guidelines
Elsipogtog First Nation	Decommissioning – monitoring of abandoned wells	• Section 2.6.7
	Indigenous Engagement – form, activities, funding	• Section 14.1.5.3 • Section 14.5
	Cumulative Effects – Impacts on traditional territory	• Section 15.2.6 • Section 15.5.5 • Section 15.3.6 • Section 15.6.5 • Section 15.4.6 • Section 15.7.5
	Species of concern – Salmon, American eel	• Section 6.1.9.2 • Section 14.1.5.1 • Section 6.1.9.6 • Section 14.1.5.2 • Section 7.3.8.2 • Section 16.7.4.3 • Section 9.5.5 • Section 16.7.9.3 • Section 9.5.6 • Appendix H
	Indigenous Rights	• Section 7.3
WNNB	Commercial Fisheries – compensation for gear damage	• Section 7.3.8.1 • Section 13.3.1 • Section 13.2.1.1 • Section 16.7.8 • Section 13.3
	Fish and Fish Habitat – impact on salmon from routine operations and accidents	• Section 9.4 • Section 16.7.4.3 • Section 14.1.5.1 • Section 16.7.9.3 • Section 14.1.5.2 • Appendix H
	Company and Operations	• Section 1.1
	Effect of Environment on the Project - icebergs	• Section 17.2.3 • Section 17.3.3
	Project Description – Equinor's offshore operations, number of wells, annual production levels	• Section 1.1.1 • Section 2.5.3
	Environmental Effects Monitoring	• Section 18.4

Table 5.2 Key Issues and Questions Raised by Indigenous Groups

Indigenous Group	Key Issues and Questions Raised	EIS Reference
WNNB	Produced Water and treatment of radioactive materials	• Section 2.7.1.5 • Section 2.8.4
	Sedimentation – impact on habitat, corals and sponges	• Section 9.3.3.4 • Section 9.4.3.4 • Section 12.3.1.1 • Section 12.2.3.1 • Section 12.3.6.2 • Section 12.4.1.1 • Section 12.4.3.1 • Section 12.4.6.1 • Section 18.4
	Project Concept and Design – activities including vessel traffic	• Section 2.5
	Accidents and Malfunctions – potential effects and emergency response	• Section 16.1 • Section 16.7 • Appendix P
	Carbon Emissions	• Chapter 8 • Appendix K
	Flaring	• Section 2.7.4.7 • Section 2.8.1 • Section 8.5.3.1
	Abandoned Wells – liability for abandoned wells	Not within the scope of the Guidelines
	Incorporation of Indigenous Knowledge	• Section 14.1.4 • Section 14.1.5.2 • Appendix H
Woodstock First Nation	Project Operations and Activities – number of wells, drilling depths, project footprint	• Section 2.5
	Indigenous Engagement – capacity funding to participate in EA process	Not within the scope of the Guidelines
	MPAs – impact of Project	• Section 12.2 • Section 12.3
	Spills and impacts on traditional waters	• Section 16.7.9
	Impact on Corals and Sponges	• Section 9.3.3.4 • Section 9.4.3.4 • Section 12.3.1.1 • Section 12.3.3.1 • Section 12.2.4 • Section 12.3.6.1 • Section 12.4.1.1 • Section 12.4.3.1 • Section 12.4.4 • Section 12.4.6.1 • Section 16.7.4
Peskotomuhkati Nation at Skutik (Passamaquoddy)	Direct and indirect impacts of spills on Marine Species of traditional / commercial importance – herring, gaspereau, mackerel	• Section 14.2.4.1 • Section 16.7.4 • Section 16.7.8 • Section 16.7.9
	Marine Mammals – right whales, harbour porpoises – ship strikes	• Section 11.5.2 • Section 11.1.5.1 • Section 11.3.1.1 • Section 11.3.4.1 • Section 11.3.5.1 • Section 11.4.4.1
	Standards for oil transport / loading	• Section 2.6.4.4

Table 5.2 Key Issues and Questions Raised by Indigenous Groups

Indigenous Group	Key Issues and Questions Raised	EIS Reference
MCPEI	Applicable Regulatory Regime – role of C-NLOPB	• Section 1.3.2
	Project Description – location, components and activities	• Section 2.4 • Section 2.5 • Section 2.6
	Spills and Safety Record	• Section 16.1 • Section 16.3 • Appendix P
	Spill trajectory / modelling	• Section 16.4
	Offloading and Transport of Oil	• Section 2.1
	Air Emissions - modelling	• Section 8.5.1.1 • Section 8.5.2.1 • Section 8.5.3.1 • Section 8.5.4 • Section 8.6.1 • Appendix K
	Impacts on salmon – species of traditional importance	• Section 14.1.5 • Section 16.7.4 • Section 16.7.9 • Appendix H
	Application of Mitigation Measures	• Section 18.2
	Indigenous Engagement – Capacity Funding	Not within the scope of the EIS Guidelines
MMS	Impacts on Salmon and other species of cultural significance	• Section 14.1.5.1 • Section 13.1.5.2 • Section 16.7.4 • Section 16.7.9 • Appendix H
Les Innus de Ekuanitshit (Innu First Nation of Ekuanitshit)	Impacts on Salmon and other species of cultural importance	• Section 14.1.5.1 • Section 14.1.5.2 • Section 16.7.4 • Section 16.7.9 • Appendix H
Première Nation des Innus de Nutashkuan	Impacts on Salmon and other Species of Concern	• Section 14.1.5.1 • Section 14.1.5.2 • Section 16.7.4 • Section 16.7.9 • Appendix H
October 2018 Workshop Issues and Concerns	Atmospheric Conditions: • Air and sound emissions • Use of technology, monitoring • Climate change and GHGs	• Section 5.7.1 • Section 8.5 • Section 8.6 • Section 9.3.2.3 • Section 9.3.3.3 • Section 9.3.4.1 • Section 9.3.5.4 • Section 9.4.1.3 • Section 9.4.3.3 • Section 9.4.4.1 • Section 9.4.5.1 • Section 10.3.1.2 • Section 10.3.2.2 • Section 10.3.3.2 • Section 10.3.4 • Section 10.3.5 • Section 11.3.1.1 • Section 11.3.2.1 • Section 11.3.3.1 • Section 11.3.4 • Section 11.3.5 • Section 11.4.2.1 • Section 11.4.3.1 • Section 11.4.4.1 • Section 11.4.5 • Appendix K

Table 5.2 Key Issues and Questions Raised by Indigenous Groups

Indigenous Group	Key Issues and Questions Raised	EIS Reference
October 2018 Workshop Issues and Concerns	Indigenous People Interactions: • Focus on shoreline interactions • Species of concern (salmon, American eel, right whales) • Effects of spills on coastal communities	• Section 6.1.9.2 • Section 6.1.9.6 • Section 6.3.7.2 • Section 7.3.8.2 • Section 9.5.5 • Section 9.5.6 • Section 10.3.4.2 • Section10.3.5.1 • Section 10.4.4.2 • Section 10.4.5 • Section 11.5.2 • Section 14.1.1.1 • Section 14.1.5.2 • Section 16.7.9 • Appendix H
	Marine and Migratory Birds: • Bird deterrent technology • Impact of lighting, flaring, seismic testing • Bird searches	• Section 10.1.5.2 • Section 10.3.1.2 • Section 10.3.2.2 • Section 10.3.3.2 • Section 10.3.4 • Section 10.3.5 • Section 10.4.1.2 • Section 10.4.2.2 • Section 10.4.3.2 • Section 10.4.4 • Section 10.4.5
	Discharges, including Produced Water • Commitment to use best available technology and monitoring • Sedimentation	• Section 2.7.1.5 • Section 9.3.3.4 • Section 9.4.3.4 • Section 12.2.3.1 • Section 12.3.1.1 • Section 12.3.6.2 • Section 12.4.1.1 • Section 12.4.3.1 • Section 12.4.6.1 • 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	• Section 7.3 • Section 11.1.5.1 • Section 11.3.1.1 • Section 11.3.2.1 • Section 11.3.3.1 • Section 11.3.4 • Section 11.3.4.1 • Section 11.3.5 • Section 11.3.5.1 • Section 11.4.2.1 • Section 11.4.3.1 • Section 11.4.4.1 • Section 11.4.5 • Section 11.4.5.1 • Section 14.2.1.1 • Section 14.2.2.1 • Section 14.2.3.1 • Section 14.2.3.2 • Section 14.2.4 • Section 14.2.4.2 • Section 14.2.4.2 • Section 14.2.5.1 • Section 14.2.5.2 • Section 18.4 • Appendix G
	Indigenous Peoples – species of cultural importance, commercial-communal fisheries	• Section 6.1.9.2 • Section 6.1.9.6 • Section 7.3.8.2 • Section 9.5.5 • Section 9.5.6 • Section 13.1 • Section 14.1.5.1 • Section 14.1.5.2 • Section 16.7.4 • Section 16.7.8 • Section 16.7.9 • Appendix H
	Accidents and Malfunctions – spill communications, spill response measures	• Section 16.1 • Appendix P
	Cumulative Effects • General approach • Impacts on Marine Fish and Fish Habitat	• Section 15.1 • Section 15.2

Table 5.2 Key Issues and Questions Raised by Indigenous Groups

Indigenous Group	Key Issues and Questions Raised	EIS Reference
October 2018 Workshop Issues and Concerns	Engagement • Ongoing communications • Capacity funding • impacts on Indigenous rights	• Section 14.4 • Section 14.1.5.1 • Section 14.1.5.2 • Section 14.1.5.3 • Section 14.4.2
	Commercial Fisheries • Mitigation • Compensation	• Section 13.1.5.2 • Section 13.2.4.1 • Section 14.1.5.3 • Section 16.7.8 • Section 18.2
	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	• Section 2.8.2 • Section 6.1.1.5 • Section 9.3.3.4 • Section 9.4.3.4 • Section 16.7.4.4 • Appendix P • Appendix Q
	Traditional Knowledge	• Appendix H
	Special Areas: • Need to include full listing of all existing and proposed Marine Protected Areas (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	• Section 6.3.7.5 • Section 6.4.2.2 • Section 6.2.4.2 • Section 12.2 • Section 12.3
	Effects of environment on Project – sea icing on FPSO	• Section 17.3.3
	Assessment Methodology – need for ecosystem approach	• Section 4.2

6.0 ENVIRONMENTAL ASSESSMENT SCOPE, APPROACH AND METHODS

The EIS was planned, prepared, and submitted in accordance with requirements of CEAA 2012, as well as the Project-specific EIS Guidelines issued by the CEA Agency on September 26, 2018, and other generic EA guidance documents issued by the CEA Agency. The scope of the Project for the purposes of the EA included each of the components and activities defined and described in Section 2.1 of this summary and as specified in Section 3.1 of the EIS Guidelines.

6.1 Identification and Selection of Valued Components

EAs typically identify and focus on components of the environment that are of ecological or socio-economic importance and/or that can serve as indicators of environmental change, and which have the potential to be affected in some way by the proposed project under assessment. These are known as Valued Components (VCs). The identification and selection of the VCs for this EA was an early, ongoing, and iterative process, based on a number of key considerations and inputs, including the EIS Guidelines, regulatory guidance, Indigenous and stakeholder engagement, professional experience, and experience and knowledge from similar offshore oil and gas projects.

The following VCs were considered in this assessment:

1) Marine Fish and Fish Habitat (including Species at Risk [SAR])
2) Marine and Migratory Birds (including SAR)
3) Marine Mammals and Sea Turtles (including SAR)
4) Special Areas
5) Indigenous Peoples
6) Commercial Fisheries and Other Ocean Uses

Further discussion of the rationale for VC selections can be found in Section 4.2 of the EIS.

6.2 Spatial and Temporal Boundaries of the Project

Study areas (spatial and temporal boundaries) have been established to direct and focus the environmental effects assessment for each VC. The boundaries are informed by the nature, scale, timing and other characteristics of the Project and the existing environmental setting, and potential environmental interactions. The boundaries for the EIS include consideration of relevant CEA Agency guidance, and the results of Equinor Canada's engagement with government departments and agencies, Indigenous and stakeholder groups.

Four spatial assessment boundaries are used in the EIS (Figure 6-1) and described below:

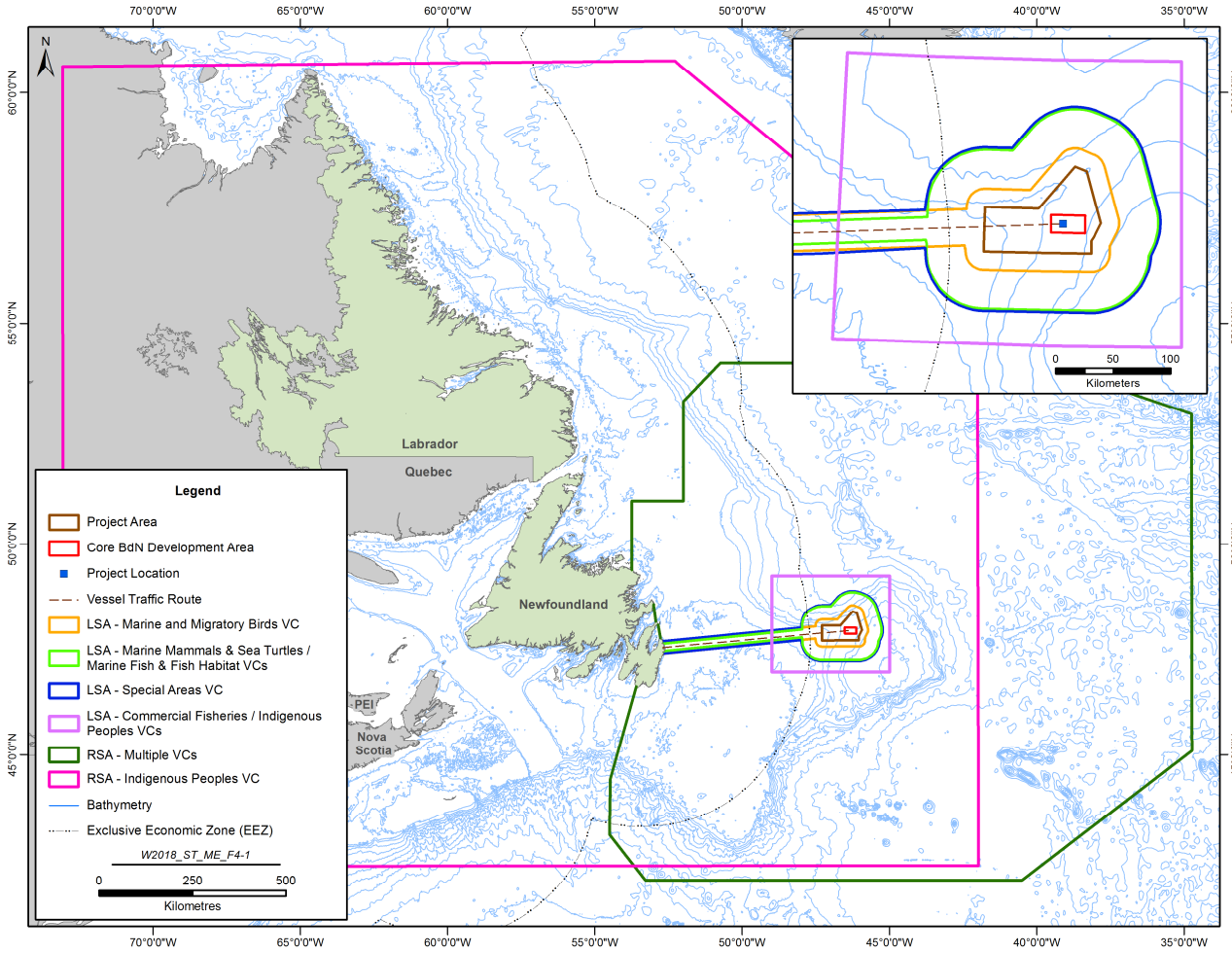


Figure 6-1 Summary of Environmental Assessment Study Areas

Core BdN Development Area - encompasses the immediate offshore area (approximately 470 km²) in which Project activities and components may occur and includes the area within which direct physical disturbance to the receiving environment may occur. The actual footprint of Project facilities within the Core BdN Development Area is approximately 7 km². The safety zone will be approximately 30 km² and the anti-collision zone ranges from approximately 1 km² (drilling installation) to 8.5 km² (FPSO).

Project Area - this offshore area is approximately 4,900 km² in size and is defined as the overall geographic area within which planned Core BdN Development and Project Area Tiebacks will occur. The Project Area is approximately 4,900 km².

Local Study Area (LSA) - represents the predicted environmental zone of influence of the Project's planned components and activities and Project Area Tiebacks. For each VC, the LSA will depend on the geographic extent of an environmental disturbance or change and may vary based on its specific nature, timing, or location.

Regional Study Area (RSA) – was defined in consideration of possible movement patterns of marine fish, birds, mammals, and sea turtles; the larger distribution and geographic extent of fishing and other human activities surrounding the Project Area / LSA; and the predicted zone of influence of a potential subsea blowout. The Indigenous Peoples VC considers the location and overall geographic extent of the various Indigenous communities and activities that comprise the VC, as well as the distribution and movements of the various marine-associated resources that are used for traditional purposes by these communities.

The temporal boundaries for the effects assessment encompass the frequency and duration of Project-related activities in the Project Area, as well as the likely timing of resulting environmental effects. In conducting the assessment, consideration is also given to the timing of VC presence within the Project and Study Areas, including important or sensitive periods. The proposed timing and duration of Project phases and activities are shown in Figure 2-1. The Core BdN Development has a life of field between 12 and 20 years. Should Project Area Tiebacks occur, production could be extended out to 30 years.

6.3 Environmental Effects Assessment (Planned Project Components and Activities)

The environmental effects assessment for each VC predicts and evaluates the nature and degree of changes to (if any), and resulting effects on, the existing environment, that may potentially occur as a result of Project components and activities. Evaluation tables and matrices are used to document the assessment. Residual Project-related environmental effects, which are those environmental effects that remain after the planned mitigation measures have been applied, are characterized for each individual VC using specific analysis criteria. These criteria include direction, magnitude, geographic extent, duration, frequency, reversibility, and context.

The application of mitigation measures is also considered in a fully integrated manner. This includes technically and economically feasible mitigation measures that are or can be incorporated into Project planning and design, as well as those that are identified as part of the effects analysis to avoid or reduce potential adverse environmental effects. The significance of residual Project-related environmental effects is then determined based on pre-defined standards or thresholds (i.e., significance rating criteria). Where pre-established standards or thresholds do not exist, significance criteria have been defined qualitatively and justifications for the criteria provided.

The interconnections between the physical, biological and human environment have been integrally considered in the EIS. Overall, the EIS is based on the interactions between Project activities and select VCs using source-pathway-receptor relationships as addressed in each VC chapter. 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. Potential effects, via direct and indirect pathways, including ecosystem linkages, have been assessed. A summary of the activities-pathways-receptors and linkages between ecosystem components of the VC is provided in tabular format for each VC chapter.

6.4 Project-Specific Modelling

In order to support effective and realistic assessment of the effects of the BdN Project, Equinor Canada undertook several modelling studies to understand the fate and behaviour of certain discharges and emissions. Figure 6-2 identifies the locations of the various modelling sites used (as appropriate). These models are applicable to the effects assessment of various VCs and are summarized below, with full reports appended to the EIS.

Drill Cuttings Dispersion Model - was completed by Wood PLC (Wood) to characterize the release of drill cuttings associated with drilling activities during the Project. Drill cuttings are the small pieces of rock, ranging in size from coarse sand to fine silts and clays, created when a drill bit penetrates rock. The material is forced up the well as drilling proceeds. A numerical model developed by Wood was used to model the dispersion of cuttings associated with the Project and to predict deposition patterns of cuttings on the seabed, including weight, density, and thickness of cuttings. To account for various drilling scenarios, two scenarios were modelled at the selected location (at 1,170 m depth): deposition from a single well; and deposition from drilling eight wells from a single location (i.e., worst-case).

Produced Water Plume Dispersion Model - was conducted by Elisabeth Deblois Inc. to examine the distribution of produced water discharge from the FPSO location. The produced water modelling exercise used the Dose Related Risk and Effects Assessment Model (DREAM), which is used globally to assess the distribution of produced water discharges. Six scenarios for produced water release were simulated, examining the distribution of individual constituents within a produced water plume by taking into account their physical properties. 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.

Underwater Sound Model – Project-specific underwater sound modelling was completed by JASCO Applied Sciences for sound emissions from 3D seismic operations, geohazard surveys using a sub-bottom profiler and multi-beam sonar, and operation of the FPSO and drilling installation. The study included use of several modeling programs developed by Jasco, including the Airgun Array Source Model and Marine Operations Noise Model. Results of the modelling study are presented as sound field contour maps and tables of maximum and 95 percent distances to sound level thresholds for the sound pressure level (SPL) fields, and as schematics of threshold contours and tables of safe distances to the specific thresholds for sound exposure levels (SELs) for select receptors.

Air Emissions Model – To provide estimates of air emissions associated with the Project, an emissions inventory was prepared, dispersion modelling was conducted, and an analysis on GHGs was completed. Air dispersion modelling was conducted for the operation of Project vessels to predict ground-level concentrations of the contaminants of interest from the Project. The latest version of the CALPUFF dispersion model (version 7.2.1) was used to predict the ground-level concentrations (GLCs).

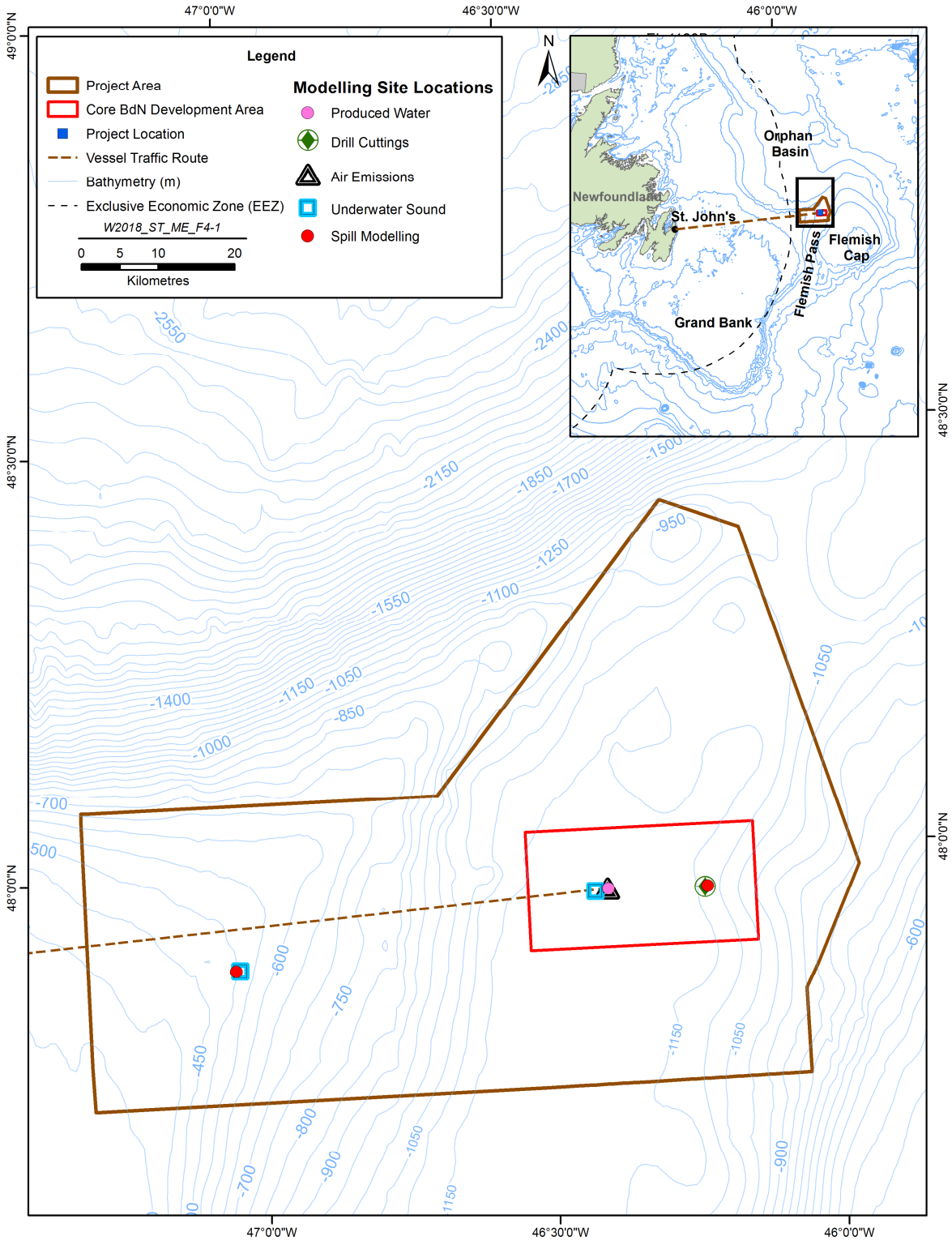


Figure 6-2 Modelling Site Locations

Spill Trajectory and SBM Spill Model - RPS conducted trajectory and fate modelling for unmitigated subsurface blowouts and batch spills of crude oil and marine diesel to support the evaluation of environmental effects of accidental events. Two release locations were used for spill modelling at representative sites within the Core BdN Development Area and the overall Project Area. Site 1 was chosen as the site for a potential subsurface blowout and batch spills within the Core BdN Development Area as it is located within a Special Area. Site 2 is a shallower site within the overall Project Area and is representative of a shallower location where Project Area Tiebacks may occur. Batch spills are also modelled from the proposed FPSO location within the Core BdN Development Area.

The accidental release of whole SBM was modelled by RPS at representative sites within the Project Area where drilling activities could occur in waters depths ranging from approximately 350 m to 1,200 m. Hypothetical deterministic simulations were performed at the same two locations used for oil spill trajectory modelling, using RPS's MUDMAP modelling system.

6.5 Cumulative Environmental Effects

As required under Section 19(1) of CEAA 2012, the EIS assesses and evaluates cumulative environmental effects that are likely to result from the Project in combination with other physical activities that have been or will be carried out, as well as the significance of these potential effects.

6.6 Accidental Events

The EIS also assesses and evaluates the potential environmental effects that may be associated with possible accidental events that may occur as a result of the Project.

6.7 Effects of the Environment on the Project

The EIS provides an assessment of the potential effects of the environment on the Project, including an overview of the manner in which local conditions and natural hazards (such as severe or extreme weather conditions and other external events) could adversely affect the Project, and how this in turn could result in effects to the environment. This analysis also includes a discussion of how these or other environmental conditions and factors have or will influence the design and execution of the Project (such as ice conditions, weather, geology), as well as associated planning, design and operational measures that will be taken to help protect the environment.

7.0 SUMMARY OF ENVIRONMENTAL EFFECTS ASSESSMENT

The following section provides a summary of the baseline conditions and environmental effects assessment completed for each VC for planned Project activities and components. Further details regarding the existing environment and the predicted Project effects can be found in the EIS. This section also summarizes potential cumulative effects of the Project, potential effects from accidental events, and the effects of the environment on the Project. An overview of potential effects over the life of the project are illustrated in Figure 7-1.

7.1 Atmospheric Environment

The EIS Guidelines lists “air quality and greenhouse gas emissions” as a suggested VC that may be considered in the EIS. These components have not been considered as an individual VC; but rather aspects of the atmospheric environment were addressed as part of the overall discussion of potential Project-related environmental emissions and their management. Predicted levels of criteria air contaminants emissions are provided in Chapter 8 of the EIS, in comparison to applicable federal and/or provincial air quality standards, include air dispersion modelling. GHG estimates, including their contribution to provincial and/or federal targets, are also included. The following provides a summary of these predictions.

7.1.1 Existing Conditions

The existing ambient air quality within the Project Area can be generally categorized as good, being occasionally and locally influenced by exhaust emissions from transient marine vessel and helicopter traffic. Operations of the existing oil production platforms (Hibernia, White Rose, Terra Nova, and Hebron) are likely too far away (approximately 180 km to 229 km away) to cause appreciable effects but are documented in the EIS for completeness. Overall, air quality in the Project Area is considered to be virtually background and to meet relevant air quality objectives of Canada.

7.1.2 Project Emissions

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 non-methane volatile organic compounds (nmVOCs) were estimated, and found to be very small, and were therefore not modelled. 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.

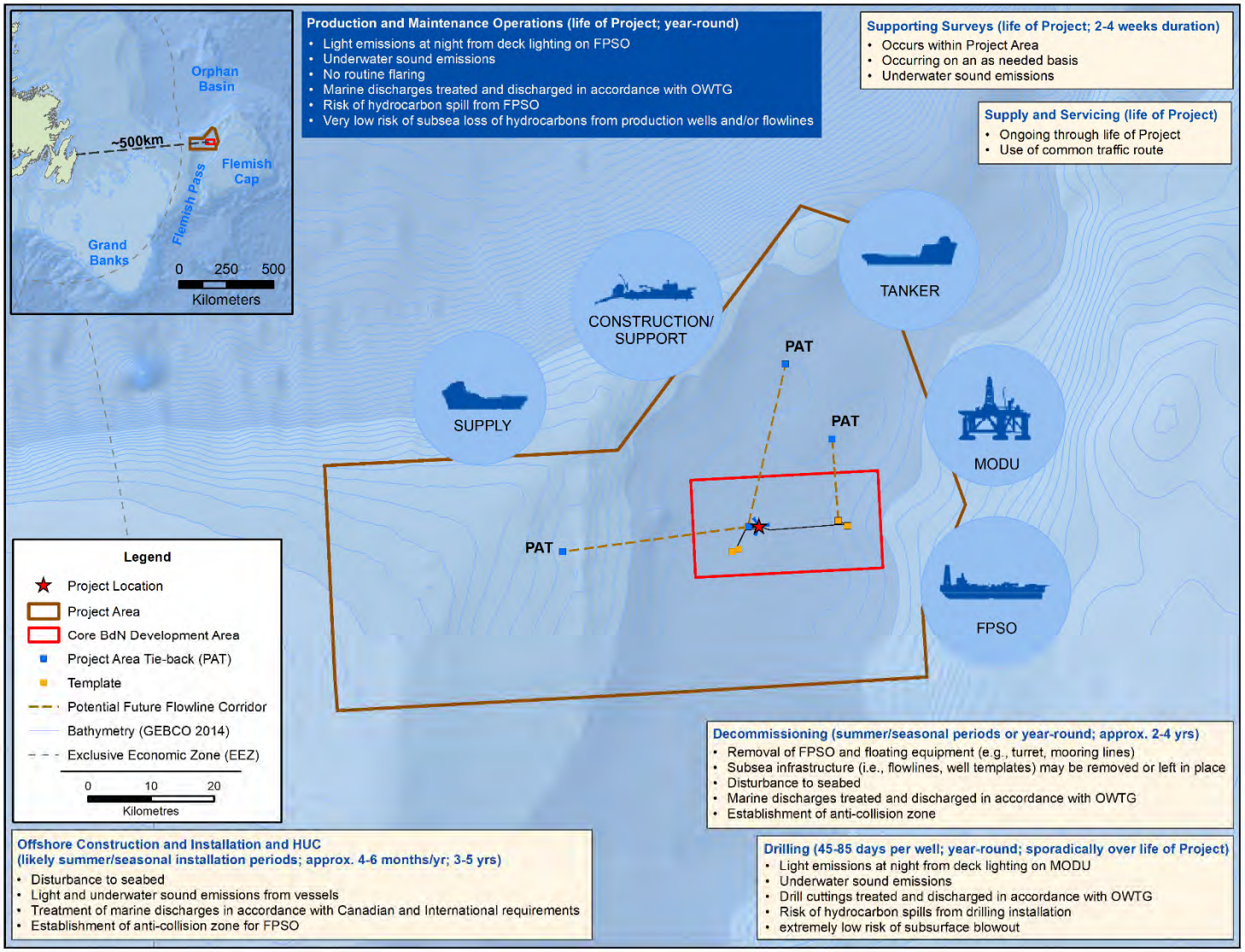


Figure 7-1 Overview of Potential Effects Over Life of Project

The predicted ground level concentrations of the air contaminants of interest to this Project were compared to both the NL Ambient Air Quality Standards (NLAAQS) and Canadian Ambient Air Quality Standards (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. 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.

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. These emissions represent 2.4 percent or less of NL's emissions and 0.04 percent or less of the national GHG emissions reported by ECCC for the year 2016.

7.1.3 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
- 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 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 CAAQS for fine particulate ($PM_{2.5}$), and IMO relevant regulations and emission limits under the International Convention for the Prevention of Pollution from Ships (MARPOL)

7.2 Marine Fish and Fish Habitat

Marine fish and their habitats are important considerations in the environmental effects assessment of activities that may affect the marine environment. The Project Area and surrounding marine environments are known to be used by a diversity of marine biota. The presence, abundance and distribution of marine fish species and associated habitat characteristics (both abiotic and biotic) vary considerably across this rather large and diverse marine environment, which transitions from relatively shallow shelf zones, through the continental slope to deep areas. These areas are used by fish and invertebrate species of commercial, cultural, and/or ecological importance and support regionally important areas of biodiversity and marine productivity.

This VC includes consideration of relevant fish species (both secure and at risk), as well as plankton, algae, marine plants, benthos, and relevant components of their habitats (such as water and sediment), given the clear interrelationships between these environmental components. Although identified fish SAR are considered integrally within the environmental effects assessment for this VC, these species are given special attention and emphasis in the identification, analysis and evaluation of potential environmental effects and required mitigation measures.

7.2.1 Existing Conditions

The Project Area includes the northern part of the Flemish Pass, and portions of the slope regions of the Grand Bank and Flemish Cap. Depths within the Project Area range from 340 m to 1,200 m, with habitats transitioning from relatively shallow slope areas to deeper bathypelagic zone areas. These areas are used by fish and invertebrate species of commercial, cultural, and ecological value and support regionally important areas of biodiversity and marine productivity.

The Project Area is an area of relatively high fish species richness, and is an aggregation area for Atlantic cod, thorny skate, and wolffish species. Greenland halibut and spotted wolffish, specifically, are known to aggregate on the Northeast Shelf and Slope Ecologically or Biologically Significant Area (EBSA) in this area in the spring. Seasonal phytoplankton blooms in the spring and fall coincide with the presence in pelagic areas of early life stages of various fish and invertebrate species. The slope in this area contains relatively high densities of habitat forming sponges and corals, and NAFO has identified three Vulnerable Marine Ecosystems (VMEs) based on these features.

Plankton, including phytoplankton and zooplankton occurs in the water column with seasonal increases in the spring and fall. The spring and fall blooms would be considered a sensitive time for various species as reproduction and presence of sensitive early life history stages coincide with these events. Calanus copepods are an important zooplankton prey species in the region with abundance dependent on their dynamics. Effects on early life history stages can have implications for connectivity between areas and recruitment to populations. Plankton also form the base of the food web and this productivity is transferred to deep waters through sinking biomass and waste. Pelagic macroinvertebrates in the area are derived from surveys on the Flemish Cap and include squid, shrimp, mysid shrimp, and jellyfish. These species are also prey species meso and epipelagic fish that occur in the area. Benthic invertebrates are characterized by echinoderms, crustaceans, and bivalves in the shelf areas, transitioning to sponges and corals on the middle to deep slopes

(including the Core BdN Development Area). Benthic surveys in the Core BdN Area indicated occurrences of corals, sponges, echinoderms, and jellyfish / anemones with lesser occurrences of shrimp, bivalves, whelk, and squid. In the Equinor 2018 seabed surveys, sea pens and soft corals were the main functional groups observed and geodid sponges were the main sponge morphological groups observed. Feeding strategies for benthic invertebrates range from predators of other invertebrates to scavengers and suspension feeders (detritus, particulate organic matter).

Within and adjacent to the Project Area, coral biomass is mainly distributed along the slopes of the Flemish Pass, Flemish Cap, and Grand Bank, with fewer observations on the Grand Bank Shelf and on top of the Flemish Cap (Murillo et al. 2011). More than 80 species of corals and sea pens have been observed in the vicinity of the Project Area, along the shelf of the Flemish Cap, the Flemish Pass and northeast slope of the Grand Banks based on bottom trawling and seabed surveys (Wareham 2009; Murillo et al. 2011; Beazley et al. 2013, Vázquez et al. 2013; Baillon et al. 2014a, 2014b; Beazley and Kenchington 2015; Miles 2018). Dominant coral functional groups in the Project Area included the sea pens and soft corals based on Canadian and European Union Research Vessel surveys and the Equinor Canada 2018 Seabed Survey. Other coral functional groups, including branching corals, black corals, and hard corals, were not commonly observed in the Project Area in Canadian and European Union Research Vessel surveys.

A total of 23 fish species that are known or likely to occur within the RSA have been designated as SAR and have associated protections under provincial or national legislation (SARA, NL ESA), or have otherwise been identified as being of special conservation concern by COSEWIC or under other processes. These include several wolffish species, Atlantic cod, cusk, American eel, Atlantic salmon, American plaice, Bluefin tuna, and a number of species of grenadier, redfish, sharks, and skates. As with secure fish species, SAR may interact with Project activities based on occupation of various habitats at different life history stages. However, many of the offshore activities and associated disturbances that will occur as a result of this Project will be either relatively localized at a specific location or transient, though of a long-term nature. Additionally, species like Atlantic salmon do not migrate in large concentrations and preferred sea surface temperatures would likely limit habitat use to temporary movement corridors in the Project Area, limiting potential for interactions with Project activities.

Only five species are listed under NL ESA or SARA legislation including the white shark (SARA: Endangered), northern (broadhead) wolffish (SARA: Threatened), spotted wolffish (SARA: Threatened) and striped (Atlantic) wolffish (SARA: Special Concern) and American eel (NL ESA: Vulnerable). Striped, northern and spotted wolffish also have ranges that overlap with the Project Area. American eel and Atlantic salmon were further described as they are species of social, cultural and traditional importance to Indigenous groups. Eleven other species have ranges distributions that may potentially overlap with the Project Area or adjacent areas including Atlantic cod, white hake, thorny skate, grenadier species, redfish species, shark species, and Atlantic bluefin tuna based on COSEWIC Assessment and Status reports. However, species range extents within the Project Area may not necessarily be areas of high utilization.

Several of the resident species are commercially harvested, such as Atlantic cod, American plaice, roughhead and roundnose grenadiers, and thorny skate. Others, like the skates, are common bycatch in commercial fisheries that target other species. Such species have experienced declines

at least in part due to fishing pressure. Many large, long-lived and/or deep-water species, such as wolffish, sharks, skates and grenadiers have long life spans, slow reproductive periods and/or occur at naturally low densities, making them vulnerable to additional mortality. Finally, several species of concern are large migratory pelagics (such as sharks and tuna) that are likely infrequent visitors to the cold waters of the Project Area.

7.2.2 Potential Changes to the Environment

Direct and indirect adverse effects on Marine Fish and Fish Habitat that could be caused by Project activities have been identified below, along with potential associated environmental changes:

- Change in habitat availability and/or quality
    - Installation and removal of subsea infrastructure may result in the harmful alteration, disruption or destruction (HADD) of fish habitat as determined by DFO and may require a Section 35(2) Fisheries Act Authorization.
    - Project-related discharges and emissions (e.g., produced water, cooling water, other liquid discharges, drill cuttings) may change the physical and/or chemical characteristics of habitats used by marine fishes (including invertebrates).
    - Project-related disturbances to the marine environment from underwater light and sounds may change the physical characteristics of habitats used by marine fishes (including invertebrates).
    - Resulting environmental change in the availability, extent and quality of habitats have the potential to affect the presence, abundance and health of marine fishes and invertebrates that use the affected areas.
- Change in food availability and/or quality
    - Project-related discharges (e.g., organic wastes) may increase organic matter in the water column. Project-related disturbances to the marine environment from underwater light and sounds may result in behavioural effects (e.g., avoidance, attraction) on marine fishes and invertebrates. Change in fish and invertebrate mortality, injury, and/or health
    - Direct environmental changes from the Project (e.g., discharge of produced water and drill cuttings, sedimentation). Smothering and burial and increased suspended sediment from discharge of drill cuttings may result in injury and mortality of marine fish and invertebrates.
    - Direct injury and mortality of marine fish and invertebrates from placement of infrastructure. Installation and removal of subsea infrastructure may result HADD of fish habitat as determined by DFO and may require a Section 35(2) Fisheries Act Authorization.

  - Indirect effects on fish health from environmental changes to food sources or fish habitat.
  - Injury or mortality to marine fishes and invertebrates as a result of exposure to underwater sound during 2D / 3D / 4D seismic surveys, wellsite surveys or VSP survey activity.
- Change in fish and invertebrate presence and/or abundance (behavioural effects)
  - Project-related disturbances to the marine environment from underwater light and sounds that may result in behavioural effects (e.g., avoidance, attraction) of marine fishes and invertebrates.

7.2.3 Potential Effects

Project activities for the Core BdN Development Area and Project Area Tiebacks have the potential to affect Marine Fish and Fish Habitat. Many of the offshore activities and associated disturbances that will occur as a result of this Project will be relatively localized at a specific location, or transient, though of a long-term nature. Implementation of mitigation measures outlined below will serve to reduce direct or indirect potential effects on the existing species, and environmental characteristics and conditions of these areas.

7.2.3.1 Core BdN Development

The installation of subsea infrastructure is predicted to have medium- to long-term disturbance effects on the benthic environment. However, the overall increase in hard structures offered via subsea infrastructure may have localized positive effects on fish abundance and diversity by creating a “reef effect” that aggregates plankton and increases invertebrate colonization, resulting in increased local productivity and food sources. This effect may be more pronounced in an area of low seabed complexity as in the Core BdN Development Area. The positive effects would last for the length of the Project activity, but combination of increased colonization opportunities and local enrichment may support faster recovery in an otherwise slow recovering environment. Subsea infrastructure is estimated to be a 7 km2 area of the seabed, which is approximately 1.5 percent of the available seabed habitat in the Core BdN Development Area. If DFO determines that the placement of subsea infrastructure and/or protection measures requires an authorization pursuant to Section 35(2) of the *Fisheries Act*, offsetting measures, if required will mitigate habitat losses.

Potential adverse effects from marine discharges would be highly localized. Produced water discharges will be rapidly dispersed in the receiving environment, reducing potential thermal or chemical environmental effects. In modelling of produced water discharges with the highest potential for environmental effects, the area of effect was localized to within 1 km of the FPSO. Drill cuttings, using worst case eight-slot well template, are predicted to accumulate in exceedance of 1.5 mm and 6.5 mm thresholds within 200 m of the drilling location, with potential for localized sedimentation effects within this area. Beyond 200 m from the drilling location, drill cuttings aggregations are predicted to be low and patchy in nature, and therefore would not likely affect fish habitat. Based on drill cuttings modelling and the area of a well template, it is conservatively estimated that the zone of influence for drill cuttings discharges is approximately 0.5 km² per well template. Considering five

well templates for the Core BdN Development, approximately 2.5 km² of the seafloor may be affected by drilling, which represents less approximately 0.5 percent of the seabed of the Core BdN Development Area. As described in the EIS, corals and sponges have ecological characteristics (sessile, suspension feeding and slow growing) that indicate they are sensitive to suspended drill cuttings, mud particles and burial in the marine environment (Raimondi et al. 1997; Larsson and Purser 2011; Allers et al. 2013; Bell et al. 2015; Purser 2015; Järnegren et al. 2016; Ragnarsson et al. 2017; Larsson et al. 2013; Liefmann et al. 2018; Vad et al. 2018, Buhl-Mortensen et al. 2015; Baussant et al. 2018). However, coral and sponge species that occur in areas with fine sediments similar to the Core BdN Development Area and larger Project area are naturally exposed to episodic pulses of suspended particles and studies have shown that many species have adapted to cope with suspended sediments (Tjensvoll et al. 2013; Kutti et al. 2015; Liefmann et al. 2018). Therefore, while there is an adverse effect on corals and sponges from drilling discharges, the magnitude remains low considering potential recovery after cessation of sedimentation and adaptation to areas of fine sediments, and localized nature of potential effects. Mitigation measure to reduce potential impacts to fish habitat may include the placement of well template locations to avoid *Lophelia pertusa* complexes and discharge locations for water-based cuttings will be based on C-NLOPB requirements to avoid *L. pertusa* complexes and coral assemblages where five or more corals greater than 30 cm are located within an area 100 m² and are within 100 m of the drill cuttings discharge location. In consideration of the OWTG (NEB et al. 2010), the use of best treatment practices that are commercially available and economically feasible will be implemented.

Marine vessel and helicopter traffic servicing the FPSO and drilling installation will be inherently transient in nature, reducing potential environmental effects associated with discharges, light and sound, to any one location. Sound generated by supply and servicing vessels could elicit avoidance behaviours in pelagic fishes, but these effects would be temporary and localized. Based on the scientific literature, rms sound pressure levels below 150 dB re 1 $\mu Pa_{(rms)}$ would not likely cause potential fitness-related behavioural changes in swim bladdered fish species studied to date. Sound levels above this behavioural effect threshold were limited to less than 150 m from the source for the drillship (100 m to 102 m behavioural effect distance), FPSO (63 m behavioural effect distance), and combined drillship and FPSO (117 m to 122 m behavioural effect distance).

Geophysical surveys within the Project Area, particularly 2D / 3D / 4D seismic surveys, will likely cause behavioural effects on fishes with swim bladders used in hearing, as well as those with higher sensitivities to particle displacement in the water column. Given the complex bathymetry in the Project Area, behavioural effects, based on sound modelling results, could extend as far as 50 km from the seismic source, depending on where the air sources are being discharged. Sound modelling also indicated that maximum received sound levels could occur at various depths within the water column. Of the geophysical activities examined, only VSP would involve a stationary sound source. A stationary sound source would likely increase the potential for chronic exposure of fishes and invertebrates to sound; but VSPs are typically quite short in duration, thereby mitigating any chronic exposure. 4D seismic surveys might also involve the deployment of receivers on the seabed, resulting in temporary, small-scale interaction with the benthic habitat. Environmental and geotechnical surveys are predicted to have similar transient and sporadic environmental effects with limited interactions with the seabed. The ecological, social and/or economic value of any fish that exhibits behavioural responses to Project-related sound will not be compromised.

The FPSO will be decommissioned and removed from the Project location. 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. Wells will be abandoned in accordance with regulatory requirements. Depending on water depth, the wellhead will either be removed during decommissioning or left in place. Well decommissioning may be carried out with a drilling installation (internal cutting of the well casing) or vessel and ROV-equipped with a mechanical cutter (external cutting of wellhead). Explosives will not be used to remove wellheads. Marine vessel and aircraft support activity levels during decommissioning would likely be similar to the construction and installation phase of the Project. Environmental, geotechnical, and/or geological surveys may be required during decommissioning.

7.2.3.2 Project Area Tiebacks

Should Equinor Canada undertake Project Area Tiebacks, these would occur within the Project Area. The tiebacks would be connected to the existing FPSO at its location in the Core BdN Development Area. Production activities could continue beyond the 12 to 20-year until end of Project life, an additional 10 to 18 years .The primary activities associated with Project Area Tiebacks affecting fish and fish habitat would be the installation of subsea infrastructure (well templates, flowlines, etc.,), drilling activities at well templates in the Project Area, and geophysical surveys at / or near these well template locations. All other activities, including Production and Operations, Supply and Servicing, and decommissioning would be the same as described and assessed for the Core BdN Development. Mitigations implemented for the Core BdN Development would be also be applied should Project Area Tiebacks be undertaken.

Offshore construction and installation and hook-up and commissioning (HUC) tiebacks in the Project Area may occur at the same time as ongoing production and/or drilling operations for the Core BdN Development. The primary interactions with Marine Fish and Fish Habitat during this phase are associated with vessels (light and sound emissions and discharges) and installation of seabed infrastructure in the Project Area. Project Area Tiebacks may include the installation of flowlines are different locations within the Project Area. The potential interactions and effects of offshore construction and installation, and HUC for Project Area Tiebacks would be the same as those assessed for the Core BdN Development. Based on preliminary Project design, for each flowline corridor, including well template, approximately 3 km² of seabed could be affected. Assuming up to five tiebacks, it is conservatively estimated that up to 15 km² of seabed in the Project Area could be affected. Therefore, with a total subsea infrastructure footprint of 15 km² for Project Area Tiebacks and 7 km² for Core BdN Development Area (approximately 22 km² in total), collectively, the placement of subsea infrastructure could interact with less than 0.5 percent of the Project Area.

The effects associated with the presence of the FPSO for the Core BdN Development would be the same as the FPSO would remain in its position in the Core BdN Development area. The only change is that the FPSO could be on-station until end of Project at 30 year, versus the estimated 12- to 20-year timeframe for the Core BdN Development. The effects characterizations would be the same as assessed for the Core BdN Development.

Potential interactions from drilling activities on Fish and Fish Habitat include light and sound emissions and drill cuttings discharges from the drilling installation, similar to those assessed under

the Core BdN Development. Fish species present in the Project Area would be the same as those present in the Core BdN Development Area and coral and sponge community presence within the larger Project Area is similar to that described for the Core BdN Development Area. In the western portion of the Project Area, in shallower waters and near the slopes, soft corals, and stony corals are likely present. In the northern parts of the Project Area in water depths similar to the Core BdN Area, solid / massive sponges (e.g., *Geodia* sp.), soft corals, and sea pens would be present. Drill cuttings discharge modelling for shallower waters (Statoil 2018) indicate that drill cuttings are predicted to accumulate in exceedance of 6.5 mm threshold within 2 km from the drilling location. Effects on benthic species, as noted above, would be similar in shallower water depths. In the deep water of the Project Area, as noted above drill cuttings modelling predict the zone of influence of drill cuttings to be within 200 m of the drill cuttings discharge location. Therefore, for tiebacks that may occur in shallower waters, the geographic extent of the effects on fish and fish habitat would be greater than in deeper waters. A conservative estimate for the zone of influence associated with drilling is approximately 13 km² per well template in shallower waters and 0.5 km² in deep waters. Assuming three well templates in shallow water and two in deep water, it is conservatively estimated that less than one percent of the seafloor in the Project Area could be affected by drilling activities. Cumulatively, a conservative estimate of the potential seabed area affected by drilling for the Core BdN Development (2.5 km² estimate; see above) and from Project Area Tiebacks (40 km²) would be 42.5 km², or less than 1 percent of the Project Area.

Supply and servicing operations would be the same as for Core BdN Development but could be carried out for an additional 12 to 18 years. The vessel and aircraft traffic route to the Project Area would be same as for Core BdN Development. Vessel traffic in the Project Area would be the same as vessel traffic in the Core BdN Development Area. Depending on the distance between the drilling installation in the Project Area and the FPSO at its fixed location, a second SBV may be required, which would be short-term while the drilling installation was on location. Should supporting surveys be required, the interactions associated with light emissions and marine discharges would be the same for the Project Area as for Core BdN Development should Project Area Tiebacks occur.

At end of field-life the Project will be decommissioned in accordance with regulatory requirements in place at the time of decommissioning. The timeframe for decommissioning, whether at the end of the Core BdN Development or at the end of Project life is anticipated to approximately two to four years. The interactions and effects associated with decommissioning would be the same as the Core BdN Development.

7.2.4 Mitigation Measures

The following mitigation measures will be used to prevent or reduce adverse effects upon marine fish and fish habitat:

- 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 five or more corals in 100 m² with heights greater than 30 cm within 100 m of the discharge location.
- Where Project activities may affect fish habitat, and it is determined through DFO's "Request for Review" process pursuant to the *Fisheries Act* that a *Fisheries Act* Authorization is required, a habitat offsetting program will be developed in conjunction with DFO and in consultation with Indigenous Groups and stakeholders as a mitigation measure for the net loss of fish habitat resulting from the Project.
- In consideration of the OWTG (NEB et al. 2010) and regulatory discharge limits, the use of best treatment practices for discharges associated with the Project 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 OCSG (NEB et al. 2009) and Equinor Canada's chemical selection and screening processes.
- Marine discharges (e.g., bilge water) are treated in accordance with MARPOL and Canadian requirements prior to discharge.
- 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 anti-fouling paint on hull of FPSO to control hull biofouling.
- In consideration of the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2019), mitigation measures applied during the Project's geophysical surveys where air source arrays are used will be consistent with those outlined in the SOCP (DFO 2007).
- Lighting on the FPSO will be reduced to the extent that worker safety and safe operations, per regulatory requirements, are not compromised. Lighting reduction options will be evaluated during detail design, and economically and technically feasible options which do not compromise worker safety and safe operations will be implemented. This may include, but not limited to shading, avoiding use of unnecessary lighting, and directional lighting (i.e., towards the deck and not out to sea). Equinor Canada will engage with ECCC on the results of the lighting engineering study(s) undertaken in the front-end engineering and design phase before proceeding to detailed design. The selection of technical and economic feasible lighting options will be undertaken at detail design phase, in which Equinor Canada will again engage with ECCC on the selection of lighting options.
- Low pressure flare gas (e.g., produced water degassing, cargo tank blanket gas) will be recovered, therefore no continuous flaring, which reduces air emissions and light emissions.
- 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.
- At the time of decommissioning, all surface facilities (e.g., FPSO, turret, anchor lines) will be removed.

While not a mitigation, 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 pen data. The survey methodology and plan will be provided to DFO in advance of survey commencement date for review and acceptance. In addition, if DFO determines a *Fisheries Act* Authorization is required regarding a HADD of fish habitat resulting from Project activities, additional fish habitat data may be required in support of the authorization.

7.2.5 Significance of Residual Effects

The primary mechanisms of interaction that may have effects on this VC include the marine discharges, sound, and light emissions associated with the Project, including those that may result in direct interaction with and effects on the seabed and sensitive benthic organisms or habitats. Although Project-related components, activities and discharges and emission interact with fish and fish habitat, the zones of influence would occupy a very small area within the entire Core BdN Development and/or Project Areas and would not contribute to an overall decline in fish abundance or change the spatial and/or temporal distribution of fish populations within the RSA. Project activities and discharges will interact with fish habitat, however the effects on fish habitat would not result in the harmful alteration, disruption or destruction of fish habitat Project Area that cannot be adequately compensated by offsetting.

For fish SAR, the potential for interactions between individuals of these species and the Project is limited, and no identified critical habitat is present in the LSA. The Project will therefore not have implications for the overall abundance, distribution, or health of these species nor its eventual recovery.

It is predicted that the Project will not result in significant adverse effects on Marine Fish and Fish Habitat. This conclusion is based on the nature and scope of the Project, knowledge about the existing environment within the LSA and RSA, and current understanding of the effects of similar projects on the VC and relevant, planned mitigation measures. The predication of no significance effects considers the variable nature of the data on seismic effects, and the uncertainties in timeframe for recovery and recolonization of benthic habitat in deep sea areas.

7.3 Marine and Migratory Birds

A variety of bird species occur within the marine and coastal environments off eastern Newfoundland at various times of the year, including seabirds and other avifauna that inhabit the region for breeding, feeding, migration and other activities according to their individual life histories and habitat

requirements. Several important habitats for birds have also been identified at locations along the coastline of NL.

Birds are important from an ecological, social, and economic perspective, because they often function near the top of the food chain and may be relatively vulnerable to certain types of environmental disturbance. Some species are also an important resource for recreational and tourism-related pursuits. Most birds found in Canada are also protected under the *Migratory Birds Convention Act* (MBCA) and its associated Regulations, which implement the terms of the Migratory Birds Convention of 1916 between Canada and the United States. Wildlife in NL (including certain species not protected under the MBCA) are managed under the provincial *Wildlife Act* and associated Regulations. Avian SAR and their habitats, including some species that are known or have potential to occur in the Project Area and surrounding marine environments, are protected by both federal (SARA) and provincial (NLESA) legislation.

7.3.1 Existing Conditions

The coastline of eastern NL and the waters offshore provide important habitat for various species of marine and migratory birds. The nutrient-rich Grand Banks and Flemish Cap regions are important feeding areas for dozens of marine bird species (Barrett et al. 2006; Fort et al. 2012, 2013). Coastal islands and mainland cliffs provide nesting grounds for tens of millions of seabirds representing some 20 species, including some of the largest seabird colonies in eastern North America south of the Hudson Strait (Lock et al. 1994). A number of special areas relevant to marine and migratory birds have also been identified in eastern NL, which have been designated as such because they provide important habitat for nationally and/or globally important numbers of birds, and/or because they support avian species of conservation concern (SOCC).

A diverse assemblage of seabirds can be found in the marine waters off eastern NL at all times of year, including tubenoses (fulmars, storm-petrels and shearwaters), gannets, cormorants, phalaropes, jaegers and skuas, alcids (auks), gulls and terns. Many of these taxa also nest along the coast of eastern NL. While seabirds occur in the Project Area, the LSA, and the RSA, the abundance and distribution of species varies considerably. Some taxa, notably kittiwake, some alcid species, and fulmar are abundant year-round (Lock et al. 1994; Fifield et al. 2009). Others are scarce or absent in the winter months, such as the shearwaters, storm-petrels, northern gannet, terns and phalaropes (Lock et al. 1994; Fifield et al. 2009). Dovekie, thick-billed murre, and ivory gull are most likely to be present in the winter months. Important Bird Areas (IBAs) and breeding colonies are found in coastal areas and inland. At several hundred kilometres offshore, the Project Area is outside of the reported foraging range of most species breeding at the major seabird colonies in coastal NL, except for Leach's storm-petrel (Lock et al. 1994; Garthe et al. 2007a, 2007b; Pollet et al. 2014; Hedd et al. 2018).

In the summer months, the greatest abundance of seabird species breeding in NL is concentrated around nesting colonies in the western RSA. However, seabirds are relatively long-lived, and for many species, individuals do not breed until four or five years of age. Large numbers of these non-breeding birds may be found far offshore, albeit spread over hundreds of square kilometres including the Project Area, during the breeding season. The fall months are an important time for Leach's

storm-petrel and migrating landbirds (e.g., passerines, which tend to be nocturnal migrants). Leach's storm-petrel is the most common species of seabird stranding on drilling and production installations and OSVs offshore in September and October, following the departure of fledglings from nearby breeding colonies (Huntington et al. 1996). The area between Flemish Cap and the mid-Atlantic Ridge, in the eastern half of the RSA, is an important staging area for migrating pelagic seabirds.

During the winter months, tens of millions of dovekies travel several thousand kilometres from their breeding grounds to their core winter distribution within the productive waters off eastern NL (Fort et al. 2012, 2013). A recent tracking study of black-legged kittiwakes has shown that the Northwest Atlantic Ocean, especially the shelf edge off NL, is an important wintering area for kittiwakes, with most of the Atlantic population overwintering in this region (Frederiksen et al. 2012). Most of eastern Canada's population of common murre and approximately one-third of the region's thick-billed murres overwinter in the waters off eastern NL (McFarlane Tranquilla et al. 2013).

Seabirds feed primarily on cod, capelin, herring, sand lance, rockfishes, lanternfishes, mackerel, tomcod, alewife, various squid species, cuttlefish, octopus, mollusks, gastropods, crabs, shrimps, lobster larvae, bivalves, whelks, fish eggs, amphipods, copepods, mysids, decapods, krill, isopods, cumaceans, polychaetes, sea butterflies, and cnidarians and and crustaceans (such as krill) (Brown et al. 1981; Steele and Montevecchi 1994; Brooke 2004; Hedd et al. 2006, 2009; Ronconi et al. 2010; Pollet et al. 2019; Drucker et al. 2020; Furness et al. 2020a, 2020b; Hatch et al. 2020; Mallory et al. 2020; Montevecchi and Stenhouse 2020; Nisbet et al. 2020; Tracy et al. 2020).

Very few avian species listed under SARA as SAR or identified by COSEWIC or IUCN as SOCC are likely to occur in the Project Area or RSA. Ivory gull (SAR) is more likely to be found in the northern reaches of the RSA and Project Area where pack ice can occur. Ross's gull (SAR) was recently discovered in winter off northeastern NL and has potential to occur in the Project Area. Two waterfowl SAR, Barrow's goldeneye and harlequin duck, occur in coastal waters of the RSA, but are considered unlikely in the Project Area. Red-necked phalaropes, assessed by COSEWIC as a SOCC, were seen in small numbers during Eastern Canada Seabirds at Sea surveys in the RSA, including the Project Area, from April to December. Peregrine falcon and short-eared owl are landbird species but have been recorded on ships at sea off the east coast of NL during migration.

There are 21 IBA sites in eastern NL and 11 of these are located within the RSA. There are three Migratory Bird Sanctuaries in the eastern NL region. Provincially, there are also numerous protected Wilderness and Ecological Reserves, including seven designated Seabird Ecological Reserves, five of which are located in eastern NL (DOEC 2016). There were also four EBSAs identified as possessing important attributes pertaining to seabirds.

7.3.2 Potential Changes to the Environment

Direct and indirect adverse effects on Marine and Migratory Birds that could be caused by Project activities have been identified below, along with potential associated environmental changes:

- Change in habitat availability and/or quality
  - Project-related components, activities and associated emissions or disturbances may change the physical characteristics of habitats used by marine birds
  - Resulting environmental changes in the availability, extent, and quality of habitats for birds have the potential to affect the presence and abundance of birds in the affected areas
- Change in food availability and/or quality
  - Changes to the availability, quantity, and quality of food sources (e.g., marine fish and invertebrates, other birds, waste generated from Project site) have the potential to affect the presence and abundance of birds
- Change in avifauna presence and abundance (behavioural effects)
  - Light emissions associated with the FPSO, drilling installations and vessels may create associated environmental changes such as food availability
  - Conversely, others may avoid the area because of the associated sensory disturbance in the marine environment
  - These potential behavioural changes may influence the spatial and temporal presence and abundance or birds in the area, as well as possibly affecting individuals or populations of birds if risk of injury / mortality, loss of access to key habitats for extended periods occurs, and/or affects key and sensitive life history stages
- Change in mortality / injury levels and health of individuals or populations
  - Potential mortality, injury of health effects may occur because of oil and gas-related activities
  - These could include potential direct Project induced environmental changes on birds (e.g., increased lighting levels or flaring) or possible indirect outcomes (e.g., artificial lighting and organic waste leading to increased rates of predation)

7.3.3 Potential Effects

Project activities for the Core BdN Development Area and Project Area Tiebacks have the potential to adversely affect Marine and Migratory Birds. Many of the offshore activities and associated disturbances that will occur as a result of this Project will be relatively localized at a specific location, or transient, though of a long-term nature. The implementation of the mitigation measures outlined

throughout this EIS will reduce direct or indirect potential effects on the existing species, and environmental characteristics and conditions of these areas.

7.3.3.1 Core BdN Development

Artificial lighting on Project installations and vessels has the potential to attract Marine and Migratory Birds, including the nocturnally-active Leach's storm-petrel, which may result in mortality from collisions, stranding and predation. The presence of the FPSO offshore at the Core BdN Development Area would be a new source of artificial lighting in a region that is relatively free of nocturnal artificial lighting. Artificial lighting may lead to changes to food availability, changes in behaviour and/or mortality and injury to marine and migratory birds. Species of marine and migratory birds in the Core BdN Development Area, which may be attracted to offshore installations, include northern fulmar, shearwaters, storm-petrels, black-legged kittiwake, and large gulls. Of these species, some are nocturnally active species (i.e., Leach's storm-petrels and great black-backed gull) that are attracted by the light emitted by artificial lighting and flares on the installation at night. Nesting Leach's storm-petrels undertake long foraging trips between globally important nesting colonies in and near the RSA and feeding areas in the deep waters off the continental shelf, including the Core BdN Development Area. These nesting colonies have been declining in size in recent decades. The potential for attraction to lighting and subsequent associated effects on injury and/or mortality will be mitigated through investigating lighting reduction options and avoiding flaring during routine operations. A systematic protocol for searches for stranded seabirds will be developed and implemented.

In the Core BdN Development Area marine vessel and helicopter traffic servicing the FPSO and drilling installation will be inherently transient in nature, reducing the potential environmental effects associated with discharges and emissions to any one location. As further mitigation, OSV traffic routes and helicopter flight paths will reduce disturbance to nesting colonies via the use of existing and common vessel and aircraft routes, and by adhering to periods of avoidance and setback distances prescribed in provincial *Seabird Ecological Reserve Regulations* and federal guidelines.

Potential adverse effects from marine discharges would be highly localized. The effects of discharges and emissions of organic waste, produced water, and SBM drill cuttings containing hydrocarbons associated with the Project will be mitigated through compliance with OWTG and regulatory discharge limits. Treatment of organic waste will reduce attraction of birds, with its potential for collision and exposure to contaminants. It will also reduce the attraction of large gull species, which are predators of Leach's storm-petrel. Treatment of produced water and SBM drill cuttings will reduce the potential for marine and migratory birds to be exposed to hydrocarbon sheens. Produced water modelling shows that a release has only a small probability of a concentration in the upper 10 m of the water column and is confined to within 1 km of the release site.

Underwater sound emissions associated with geophysical surveys may cause behavioural changes and injury effects in Marine and Migratory Birds, especially diving birds such as alcids. The risk of auditory injury in diving birds exposed to air source pulses is considered low and would likely be limited to a small area around the air source array used in geophysical surveys.

The FPSO will be decommissioned and removed from the Project location, thereby removing the light source offshore. Behavioural and associated secondary effects (injury/mortality) would be removed as the area returns to baseline conditions. Vessel presence associated with decommissioning would have the same effect as during normal operations, and would be reversible once decommissioning is completed.

7.3.3.2 Project Area Tiebacks

Should Equinor Canada undertake Project Area Tiebacks, these would occur within the Project Area. The tiebacks would be connected to the existing FPSO at its location in the Core BdN Development Area. Production activities could continue beyond the 12 to 20-year until end of Project life, an additional 10 to 18 years. The primary activities associated with Project Area Tiebacks affecting Marine and Migratory Birds would be light emissions from vessels engaged in construction and installation, drilling activities at well templates in the Project Area, and geophysical surveys at / or near these well template locations. The FPSO would remain on its location in the Core BdN Development Area. As there would be no changes associated with light emissions, discharges, or non-routine flaring, the potential effects of production and maintenance operations would be the same as described and assessed for the Core BdN Development. The longer life would increase the timeframe for the interactions to occur. Mitigations implemented for the Core BdN Development would also be applied should Project Area Tiebacks be undertaken.

The primary interactions associated with vessel and/or installation presence (light emissions and marine discharges) from activities in the Project Area would be the same as those assessed in the Core BdN Development Area. The presence of vessels and/or drilling installation in the Project Area would be source of light in a region that is relatively free of nocturnal artificial lighting. As noted above, artificial lighting may lead to changes to food availability, changes in behaviour and/or mortality and injury to marine and migratory birds. Marine and Migratory Birds presence for the Core BdN Development would be the same over the entire Project Area, where Project Area Tiebacks may occur. Light reduction mitigations are not technically feasible on drilling installations. Drilling installation and/or vessels will be on-site in the Project Area for a short timeframe and will leave once activities are completed.

Supply and servicing operations would be the same should Project Area Tiebacks be undertaken but could be carried out for an additional 12 to 18years. The vessel and aircraft traffic route to the Project Area would be same as for Core BdN Development. Vessel traffic in the Project Area would be the same as vessel traffic in the Core BdN Development Area. Depending on the distance between the drilling installation in the Project Area and the FPSO at its fixed location, a second SBV may be required, which would be short-term while the drilling installation was on location. The longer life would increase the timeframe for the interactions to occur. Should supporting surveys be required, the interactions and associated effects due to underwater sound emissions would be the same in the Project.

At end of field-life the Project will be decommissioned in accordance with regulatory requirements in place at the time of decommissioning. The timeframe for decommissioning, whether at the end of the Core BdN Development or at the end of Project life is anticipated to be the same. The interactions

and associated effects, due to the removal of the FPSO would be the same for the Core BdN Development.

7.3.4 Mitigation Measures

Key mitigation measures that will be integrated into the Project to help avoid or reduce potential environmental effects on Marine and Migratory Birds include:

- Lighting on the FPSO will be reduced to the extent that worker safety and safe operations, per regulatory requirements, are not compromised. Lighting reduction options will be evaluated during detail design, and economically and technically feasible options, which do not compromise worker safety and safe operations, will be implemented. This may include, but not limited to shading, avoiding use of unnecessary lighting, and directional lighting (i.e., towards the deck and not out to sea). Equinor Canada will engage with ECCC on the results of the lighting engineering study(s) undertaken in the front-end engineering and design phase before proceeding to detailed design. The selection of technical and economic feasible lighting options will be undertaken at detail design, whereby Equinor Canada will again engage with ECCC on the selection of lighting options.
- With regards to stranded seabirds the following will be undertaken:
    - Routine systematic searches for stranded seabirds will be conducted on vessels engaged in construction and installation activities and HUC, the FPSO, drilling installation, SBVs, and during supporting surveys. Searches will be undertaken by vessel / installation crew, who have been trained in bird identification and handling.
    - Equinor Canada will work with ECCC to develop installation / vessel-specific protocols applicable to the Project with respect to the systematic searches for, and documentation of, stranded birds.
    - Appropriate programs and protocols for the collection and release of stranded seabirds will be implemented and will be developed in consideration of ECCCs “Procedures for handling and documenting stranded birds encountered on infrastructure offshore Atlantic Canada” (ECCC 2017)..
    - If a SAR is found alive (stranded) or dead on an installation/vessel a report will be sent to ECCC identification.
- A Seabird Handling Permit will be obtained from ECCC annually.
- In accordance with ECCC requirements, an annual report and all occurrence data will be submitted to ECCC which summarizes stranded and/or seabird handling occurrences.
- Flaring on the FPSO will not occur during routine operations and excess gas will be reinjected into the reservoir, reducing air and light emissions.
- Low pressure flare gas (e.g., produced water degassing, cargo tank blanket gas) will be recovered, therefore no continuous flaring, which reduces air and light emissions.
- High-efficiency burners (flare tip) will be used when flaring is required to reduce air emissions.

- The preferred option is for well clean up to be done through the FPSO, thereby reducing need to flare from the drilling installation. However, if required, the option is available to flare from the drilling installation during well clean-up and/or well testing.
- The duration of non-routine flaring will typically be of short duration and will be governed by Equinor best practices to reduce overall flaring duration, thereby reducing light emissions from flaring.
- A flaring and venting plan will be submitted to the C-NLOPB for review and acceptance in in support of the application for Operations Authorization, which will outline planned non-routine flaring events. It is the understanding of Equinor Canada that a flaring and venting plan is required to be submitted annually for approval.
- In consideration of the OWTG (NEB et al. 2010) and regulatory discharge limits, the use of best treatment practices for discharges associated with the Project that are commercially available and technically feasible will be implemented.
- Appropriate procedures will be implemented for the handling, storage, transportation, and onshore disposal of solid and hazardous waste.
- Sewage and grey water will be treated in consideration of the OWTG and in accordance with Canadian and international regulatory requirements (e.g., IMO).
- Marine discharges (e.g., bilge water) are treated in accordance with MARPOL and Canadian requirements prior to discharge
- The selection and screening of chemicals to be discharged, will be undertaken in consideration of the OCSG (NEB et al. 2009) and Equinor Canada's chemical selection and screening processes.
- Use of common traffic routes for vessels and helicopters will be used where possible and practicable.
- Low-level aircraft operations will be avoided where it is not required per Transport Canada protocols.
- Helicopter flight paths and OSV transit routes will adhere to the periods of avoidance and specific set back distances, associated with specific, established migratory bird nesting colonies outlined in the NL *Seabird Ecological Reserve Regulations*, 2015, and in consideration of federal guidelines in order to reduce disturbance to colonies.
- 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.
- At the time of decommissioning, surface facilities (e.g., FPSO, turret, anchor lines) will be removed.

7.3.5 Significance of Residual Effects

It is predicted that the Project will not result in significant adverse effects on Marine and Migratory Birds. Although Project-related components, activities and emissions may result in some localized, short- to long-term interactions with Marine and Migratory Birds in parts of the LSA, the number of individuals that may be affected, and the temporary and reversible nature of these interactions, means that the Project will not have overall ecological or population-level effects and will not result

in detectable decline in overall bird abundance or changes in the spatial and temporal distributions of bird populations within the RSA. This conclusion is based on the nature and scope of the Project, knowledge about the existing environment within the LSA and RSA, and current understanding of the effects of similar projects on the VC and relevant, planned mitigation measures. This overall significance prediction considers the uncertainties noted in the EIS report associated with the numbers strandings of marine and migratory birds on installations and vessels in offshore Newfoundland associated with the lack of systematic protocols to search for and document bird strandings.

The primary mechanisms of interaction that may have effects on this VC include attraction associated with Project light emissions, increased foraging opportunities, potential for predation on seabirds attracted to Project lighting, and potential hydrocarbon sheening which are likely episodic and not continuous. While these interactions may lead to increased potential for mortality or injury of individuals, the magnitude of these changes are anticipated to be low, spatially limited and long-term during production operations. For SAR, the potential for interactions between individuals and the Project is limited, and no identified critical habitat is present in the LSA. The Project will therefore not have implications for the overall abundance, distribution, or health of these species nor its eventual recovery. With the application of mitigation measures, the residual environmental effects on Marine and Migratory Birds are predicted to be not significant.

7.4 Marine Mammals and Sea Turtles

Marine Mammals and Sea Turtles were selected as a VC because of the potential for these species to interact with Project components and activities, and because of their ecological, economic, and cultural importance, as identified by government departments and agencies, Indigenous and stakeholder groups. Additionally, many species of marine mammals and sea turtles that occur offshore NL are considered at risk. The Marine Mammal and Sea Turtle VC considers species that are secure, as well as those listed under SARA or identified by COSEWIC as SAR. However, SOCC are given special attention and emphasis in the identification, analysis and evaluation of potential Project effects and required mitigation measures. Due to similarities in habitat use and the nature of potential interactions with Project components and activities, sea turtles are assessed together with marine mammals, with key differences noted where applicable.

7.4.1 Existing Conditions

Marine mammals and sea turtles that do or may occur in the Project Area and/or larger RSA include an estimated 23 species of cetaceans (whales, dolphins, and porpoises, of which seven are mysticetes or baleen whales and 16 are odontocetes or toothed whales); four species of phocids (seals); and four species of sea turtles. Nine marine mammal and two sea turtle SAR have been identified as having the potential to be present off eastern NL: blue whale, North Atlantic right whale, bowhead whale, fin whale, northern bottlenose whale, Sowerby's beaked whale, killer whale, beluga whale, harbour porpoise, leatherback sea turtle, and loggerhead sea turtle. No critical habitat has been designated for marine mammals or sea turtles within the Project Area and RSA. The Northeast Shelf and Slope EBSA overlaps with the Project Area and has been noted as having concentrations of cetaceans and phocids.

Baleen whale species expected to be most common off eastern NL include humpback whales, fin whales, and minke whales. Small-toothed whale species are expected to occur in both coastal and offshore waters, while sperm whale and beaked whale sightings are more likely to be associated with the continental slope. Harbour seals are concentrated primarily in coastal areas, while the other three species of phocids are more widespread and can be found in deeper waters when not breeding or whelping on land or pack ice. Leatherback sea turtles are considered most likely to be observed over the continental slope areas off the Grand Banks and south of the Flemish Cap; however, they regularly occur west of the RSA in the Placentia Bay area. The likelihood of loggerhead, green, and Kemp's ridley sea turtles occurring in the Project Area is considered low.

With respect to overall timing of presence, multiple species of baleen and toothed whales can be found in the waters off eastern NL year-round, while others are more typically observed during the summer and early fall, feeding and socializing in the highly productive waters of the Grand Banks, the Flemish Pass, Sackville Spur, and surrounding waters. In fall and winter, some of the species present migrate south to their breeding and wintering grounds, which are generally located in more tropical / sub-tropical latitudes. However, some species, and individuals that do not travel south to breed, have the potential to be found in the area year-round. Most of the phocid species can be found here throughout the year, but hooded seals primarily occur in the region during the winter and early spring. Sea turtles are expected to be found offshore NL in their highest numbers during the summer and fall.

The life history characteristics, foraging strategies, and prey of marine mammals in the Project Area are poorly understood. There are no direct studies of marine mammal prey preferences and foraging strategies in the Project Area or LSA. Information for the RSA is dated and limited to a few species. Capelin and herring are considered large components for most marine mammal diets during the summer, with mackerel serving as an important prey species in the fall on the west coast of Newfoundland and southern Labrador (Lawson, J., DFO Research Scientist, pers. comm., 12 May 2020). Sperm whales consume squid (Lien 1985) as do northern bottlenose whales (DFO 2016). In addition to capelin, sand lance and euphausiids are considered important prey for most baleen whales (Mitchell 1973, 1974, 1975).

7.4.2 Potential Changes to the Environment

Direct and indirect adverse effects on Marine Mammals and Sea Turtles that could be caused by Project activities are identified below, along with potential associated environmental changes:

- Change in injury levels (underwater sound)
  - Project-related activities (e.g., installations at site, geophysical surveys, vessel transits) will introduce underwater sound to the marine environment and result in changes to the acoustic environment
  - Exposure to underwater sound levels at or above established acoustic thresholds has the potential to result in hearing impairment and/or injury to marine mammals and sea turtles

- Change in mortality / injury levels (ship strikes)
  - Project-related activities will require the use of marine vessels throughout the Project
  - Marine vessel traffic has the potential to result in ship strikes with marine mammals and sea turtles
- Change in habitat quality and/or use (behavioural effects)
  - Project-related activities (e.g., installations at site, geophysical surveys, vessel transits) will introduce underwater sound to the marine environment and result in changes to the acoustic environment
  - Exposure to underwater sound levels at or above published and/or industry standard thresholds has the potential to result in behavioural changes (e.g., changes in activity, movement) in marine mammals and sea turtles
  - Communication masking and increased stress levels may also occur at sound levels potentially below those for which overt behavioural responses may occur
- Change in prey availability and/or quality
  - Project components and activities have the potential to change the availability and/or quality of marine mammal and sea turtle prey
  - This may have secondary effects on marine mammal foraging options and success
- Change in health (contaminants)
  - Discharge of produced water, drill cuttings, and/or marine discharges have the potential to introduce contaminants to the marine environment and result in changes to water quality in the affected areas
  - Introduction of contaminants has potential to adversely affect marine mammal and sea turtle short- or long-term health

7.4.3 Potential Effects

Project activities within the Core BdN Development Area will occur year-round over a 12- to 20-year period, and Project Area Tiebacks may extend activities out to 30 years (total), should it occur. Each of the six Project phases will interact with Marine Mammals and Sea Turtles and may result in a change in injury and/or mortality levels, habitat quality and use, and prey availability or quality. Only marine discharges during production and maintenance operations were identified as potentially resulting in a change in Marine Mammal and Sea Turtle health through the release of produced water.

7.4.3.1 Core BdN Development

Marine Mammals and Sea Turtles may experience injury and/or mortality if they are struck by a Project vessel in transit along the vessel transit route and/or in the Core BdN Development Area. Based upon a review of available information, the potential for this to occur in the Project Area and along the vessel traffic route to / from the Core BdN Development Area is considered low and is further reduced by mitigation measures such as use of common traffic routes for vessels and Project vessels will alter course and/or reduce speed if a marine mammal(s) (or sea turtle) is detected ahead of the vessel. Likewise, the assessment for potential auditory injury resulting from exposure to underwater sound from impulsive sound sources (i.e., air source arrays, multibeam echosounder used during supporting surveys) and continuous sound sources (i.e., Project vessels including the FPSO and drillship) concluded that with mitigation measures in place (i.e., adherence to the SOCP), auditory injury in marine mammals and sea turtles was considered unlikely to occur. Underwater sound generated during all Project components was assessed as potentially resulting in localized (ranging from 1-10 km² to 100-1000 km²) and likely short-term avoidance of sound sources by Marine Mammals and Sea Turtles. Based on behavioural threshold criteria, acoustic modelling results and a review of the literature, the extent of this avoidance was predicted to be highest for activities using air sources (i.e., seismic surveys and to a lesser extent geohazard surveys and VSP) and for the FPSO and drillship which will employ DP thrusters. There is some uncertainty in how marine mammals (and sea turtles should they occur there) will respond to multiple sound sources from concurrent Project activities. The discharge of produced water may affect the health of marine mammals and affect prey availability. The zone of influence associated with the produced water discharge is localized to the FPSO (i.e., within 1 km of the FPSO). Produced water will be treated prior to discharge. The effects on marine mammal health and prey availability are considered of negligible.

The FPSO will be decommissioned and removed from the Project location. Underwater sound emissions during decommissioning would be the primary interaction with Marine Mammals and Sea Turtles, similar to underwater sound emissions from the FPSO and project vessels during Core BdN Development activities. There is little potential for interaction of marine mammals with well decommissioning. Environmental, geotechnical, and/or geological surveys may be required during decommissioning, of which the effects would be the same as those assessed for the Core BdN Development.

7.4.3.2 Project Area Tiebacks

Should Equinor Canada undertake Project Area Tiebacks, these would occur within the Project Area. The tiebacks would be connected to the existing FPSO at its location in the Core BdN Development Area. Production activities could continue beyond the 12 to 20-year until end of Project life, an additional 10 to 18 years. The primary activities associated with Project Area Tiebacks affecting Marine Mammals and Sea Turtles would be sound emissions from drilling activities at well templates in the Project Area and geophysical surveys at / or near these well template locations. The FPSO would remain on its location in the Core BdN Development Area, therefore interactions and associate effects addressed in the Core BdN Development would be the same should Project Area Tiebacks be undertaken. The longer life would increase the timeframe for the interactions to occur.

The species of marine mammals and sea turtles which may occur in the Core BdN Development is considered the same as those for the larger Project Area. However, it is possible that the occurrence of baleen whales may be greater in the shelf area of the Project Area. Deeper diving cetaceans like sperm, pilot and beaked whales (including northern bottlenose whales), would be more common in the deeper waters of Flemish Pass and Sackville Spur, similar to the Core BdN Development Area. Mitigations implemented for the Core BdN Development would be also be applied should Project Area Tiebacks be undertaken.

Potential interactions from drilling activities on Marine Mammals and Sea Turtles in the Project Area include underwater sound emissions from the drilling installation, as assessed for the Core BdN Development Area. If drilling activity occurred closer to the Sackville Spur, it is possibly that more northern bottlenose whales may be present than in the Core BdN Development Area. Regardless, the interactions would be the same at these well template locations as those in the Core BdN Development Area. Supply and servicing operations as assessed for the Core BdN Development would be the same and could be carried out for an additional 10 to 18 years; therefore, interactions with marine mammals are likely. Should supporting surveys be required, the interactions and associated effects due to underwater sound emissions are the same as assessed above. However, it is possible that if geophysical surveys occur in the northern portion of the Project Area, i.e., closer to the Sackville Spur, a greater number of northern bottlenose whales could be exposed to stronger sounds from the air source arrays. The application of mitigation measures (i.e., the measures outlined in the SOCP) would reduce potential effects on Marine Mammals and Sea Turtles.

At end of field-life the Project will be decommissioned in accordance with regulatory requirements in place at the time of decommissioning. The timeframe for decommissioning, whether at the end of the Core BdN Development or at the end of Project life is anticipated to be the same. The interactions and associated effects, due to decommissioning would be the same as for the Core BdN Development.

7.4.4 Mitigation Measures

Key mitigation measures that will be integrated into the Project to help avoid or reduce potential environmental effects on Marine Mammals and Sea Turtles include:

- In consideration of the OWTG (NEB et al. 2010) and regulatory discharge limits, the use of best treatment practices for discharges associated with the Project that are commercially available and economically feasible will be implemented.
- Sewage and grey water will be treated in consideration of the OWTG (NEB et al. 2010) and in accordance with Canadian and international regulatory requirements (e.g., IMO).
- 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.
- 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.
- Low-level aircraft 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 2019), mitigation measures applied during the Project's geophysical surveys where air source arrays are used will be consistent with those outlined in the SOCP (DFO 2007). This includes implementing shut down of the air source array(s) when SAR listed as Endangered or Threatened on Schedule 1 of SARA (as well as all beaked whale species) are detected within the safety zone anytime air sources are active, including ramp up.
- Shut-down of air source arrays for all beaked whales when detected within safety zone.
- 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.
- Equinor Canada will communicate seismic survey plans to C-NLOPB and geophysical operators as early as possible to reduce concurrent seismic surveys and/or to maximize the separation distance between surveys to the extent possible.
- Equinor Canada will develop a marine mammal and sea turtle monitoring plan for 4D seismic surveys which will be provided to DFO for review and input.
- If Equinor Canada is aware of a Project vessel striking a marine mammal or sea turtle, Equinor Canada will inform DFO through their 24-hour emergency contact number (1-888-895-3003)
- 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.
- At the time of decommissioning, all surface facilities (e.g., FPSO, turret, anchor lines) will be removed.

7.4.5 Significance of Residual Effects

Although Project-related activities are generally predicted to result in localized, short-term effects on marine mammals and possibly sea turtles in the Project Area (possibly extending to the LSA), the number of individuals that may be affected, and the temporary and reversible nature of these effects, indicates that the Project will not result in a detectable decline in overall marine mammal and sea turtle abundance or changes in the spatial and temporal distributions of marine mammal and sea turtle populations. The potential for interactions between individuals of SAR and the Project is considered limited (with the likely exception of fin whales, northern bottlenose whales, and possibly Sowerby's beaked whales), and no identified critical habitat is present in the Project Area, LSA, or

RSA. The Project is not predicted to jeopardize the overall abundance, distribution, or health of SAR. With mitigation and environmental protection measures, the residual environmental effects on Marine Mammals and Sea Turtles (including SAR) are predicted to be not significant. This conclusion is based on the nature and scope of the Project, knowledge about the existing environment within the LSA and RSA, and current understanding of the effects of similar projects on the VC and relevant, planned mitigation measures. This overall significance prediction considers the uncertainties noted in the EIS report associated with limited baseline data on marine mammal and sea turtle use of the Project Area, and the lack of systematic information on marine mammal response to multiple, concurrent oil and gas activities, like those that will occur periodically during the Project.

7.5 Special Areas

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 in offshore NL have been identified based on their defining environmental features, including the presence of sensitive habitats and VCs such as Marine Fish and Fish Habitat, Marine and Migratory Birds and Marine Mammals and Sea Turtles and their human use and societal value. Various types of special areas in marine and coastal environments have been identified and/or protected based on socio-economic interests such as economic or recreational / cultural activities. These include protective measures (e.g., closures) to reduce the effects of bottom-trawl fishing to support long-term sustainability of commercial fisheries. The Special Areas VC provides an assessment of potential effects of the Project on these areas based on the defining features for which special areas have been identified and/or protected.

7.5.1 Existing Conditions

A number of marine and coastal areas in NL have been designated as protected under provincial and/or federal legislation, and/or international agreements due to their ecological, historical, or socio-cultural characteristics and importance. Table 7.1 provides a summary listing of those special areas in the LSA, including those that intersect with the Core BdN Development Area, Project Area, and as noted the vessel traffic route. Figure 7-2 shows the location of Special Areas within the LSA. The overall and defining environmental features and characteristics of the special areas that intersect with the Core BdN Development Area and Project Area are important benthic habitats, such as sponge and coral grounds and sea pen fields, which are sensitive areas because of their high biological activity and slow recovery rates.

Table 7.1 Summary of Special Areas in the LSA

Special Area	Defining Features	Nearest Distance[1] 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)[2]
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 (SiBAs)				
Sea Pens	Predicted presence probability of sea pens or large gorgonian corals	90	32	Intersect (1)[3]
Large Gorgonian Corals		116	58	Intersect (TR) (1)
Snow Crab Stewardship Exclusion Zones				
Near Shore (2 areas)	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)

Special Area	Defining Features	Nearest Distance[1] 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) Fishery Closure Areas (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)

1. All distances are calculated in NAD83 UTM Zone 23N Projection
2. TR refers to the Traffic Route. Special areas intersecting the LSA along the Traffic Route is noted with a TR in parentheses.
3.For SBAs and VMEs, numbers in parentheses indicate the number of this type of special area intersecting with the CBdN, PA or LSA.

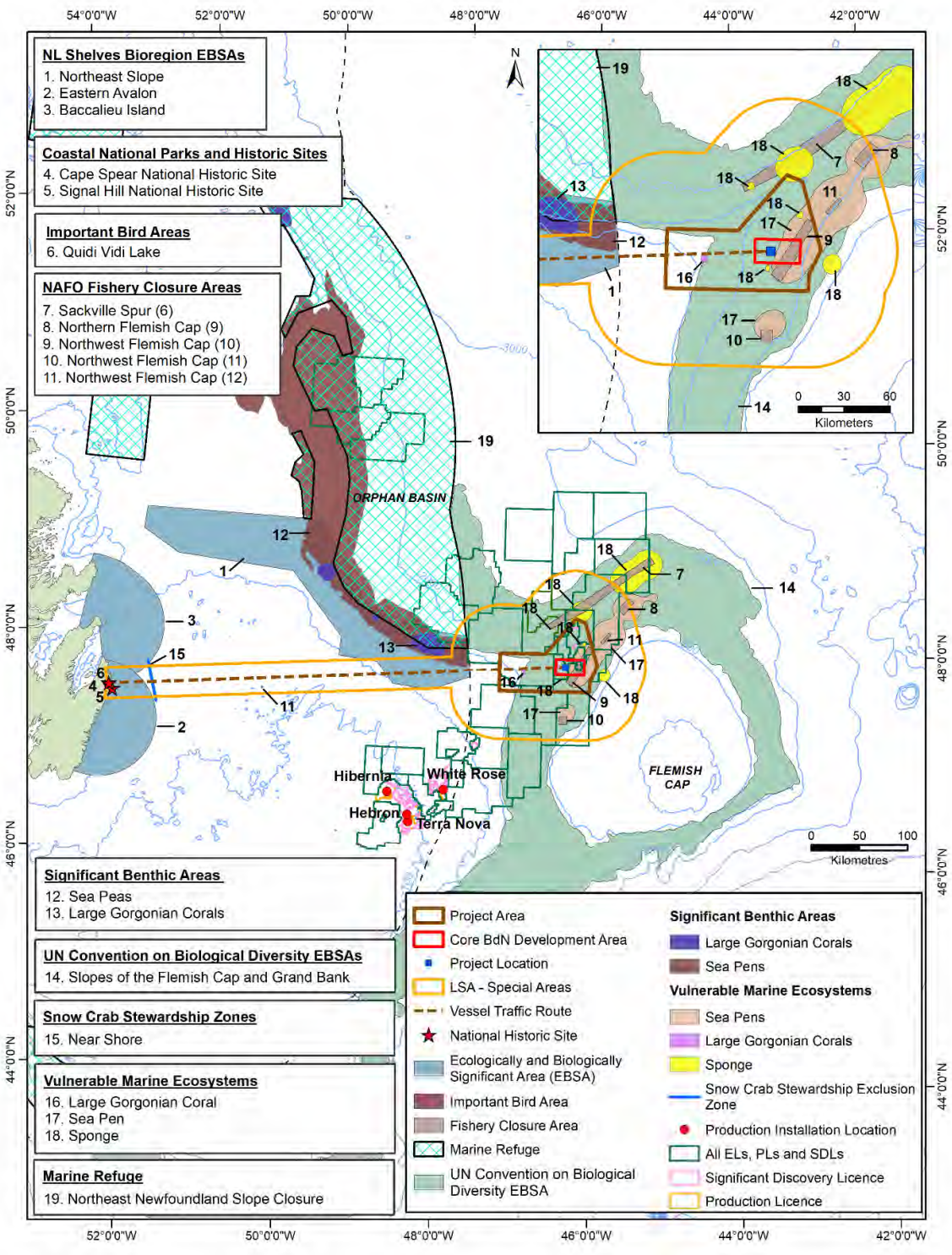


Figure 7-2 Overview of Special Areas in the LSA

7.5.2 Potential Changes to the Environment

Direct and indirect adverse effects on Special Areas that could be caused by Project activities are identified below, along with potential associated environmental changes:

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

7.5.3 Potential Effects

Project activities have the potential to result in residual effects on defining features of special areas that intersect with LSA. 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. 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 of the EIS).

7.5.3.1 Core BdN Development

Several 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. 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 depend on

a variety of factors including local biotic communities, depths, oceanographic processes, structure design and configuration, material composition. The actual seabed footprint of Project facilities within the Core BdN Development Area is approximately 7 km². The predicted zone of influence for drill cuttings is approximately 0.5 km² per well template (2.5 km² in total for all well templates). Well templates, and hence drilling, will likely occur within the Northwest Flemish Cap (10) Fisheries Closure Area (FCA) in the Core BdN Development Area. Assuming two well templates will be located in the FCA, the total area affected by drill cuttings would be approximately 1 km², or less than 1 percent of area of the FCA within the Core BdN Development Area or less than 0.5 percent of the entire FCA. Project disturbances to benthic habitat will be localized and of medium to long-term in duration. Subsea infrastructure and drill cuttings deposition will represent small areas of disturbance (9.5 km²) to benthic habitats within the extensive areas of marine environment of special areas in the offshore. Subsea infrastructure may provide habitat replacement for corals and sponges. Mitigation measures applicable to benthic habitat will be implemented to prevent or reduce environmental effects on the defining features of these special areas, such avoiding *Lophelia pertusa* when placing well templates and adhering to C-NLOPB guidance regarding setback distances of cuttings discharges for coral assemblages.

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.

The primary interaction with Special Aras associated with decommissioning is the removal of the subsea infrastructure and well decommissioning in the FCA. 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. Wells will be abandoned in accordance with regulatory requirements. If subsea infrastructure is removed, while there would be effects associated with sedimentation during removal, the area would return to baseline conditions overtime. For well decommissioning, depending on water depth, the wellhead will either be removed or left in place. Well decommissioning may be carried out with a drilling installation (internal cutting of the well casing) or vessel and ROV-equipped with a mechanical cutter (external cutting of wellhead). Explosives will not be used to remove wellheads. There may be localized effects from sedimentation.

7.5.3.2 Project Area Tiebacks

There four Special Areas intersecting with the Project Area, three Sponge VMEs and a Large Gorgonian Coral VME, in addition to the three special areas in the Core BdN Development Area. Therefore, there are seven special areas intersecting with the Project Area. Each of these special areas has been identified and/or protected due to the presence of high concentrations of sensitive benthic species such as corals, sponges, and sea pens. As the defining nature of the Special Areas in the Project Area are associated with benthic habitat, the primary interactions during Project Area Tiebacks (Figure 7-3) would be those activities that interact with the benthic community, primarily the installation of subsea infrastructure and drilling activities.

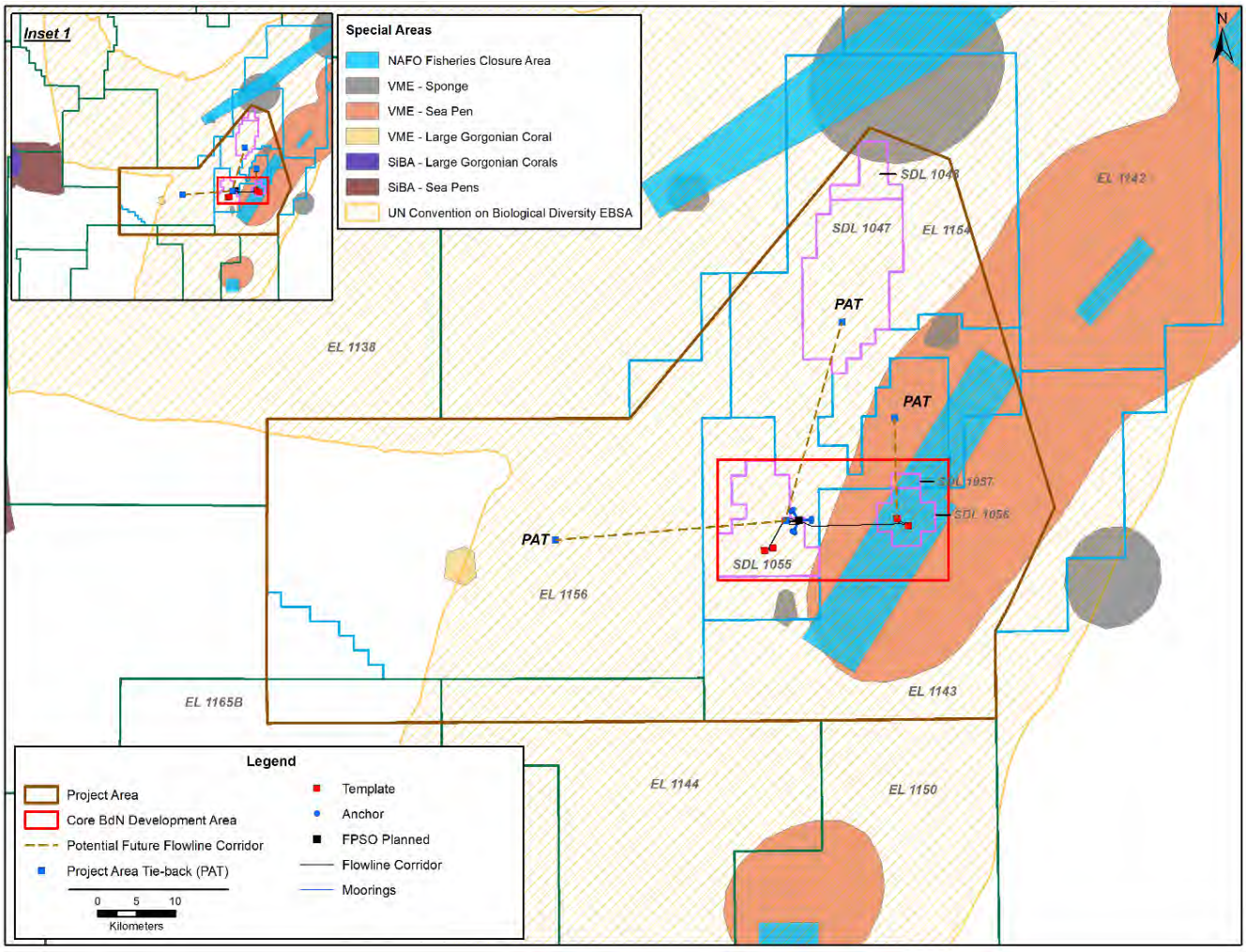


Figure 7-3 Special Areas in Vicinity of Project Area Tiebacks

The potential interactions and effects of offshore construction and installation, and HUC for Project Area Tiebacks would be the same as those assessed for the Core BdN Development. Based on preliminary Project design, for each flowline corridor, including well template, approximately 3 km² of seabed could be affected. Assuming up to five tiebacks, it is conservatively estimated that up to 15 km² of seabed in the Project Area could be affected. As noted above, seven special areas intersect with the Project Area Tiebacks with a total area of 4,015 km² within the Project Area. Therefore, with a total subsea infrastructure footprint of 15 km² for Project Area Tiebacks and 7 km² for Core BdN Development Area (approximately 22 km² in total), collectively, the placement of subsea infrastructure could interact with approximately 0.5 percent of the special areas in the Project Area.

There are no interactions between production and maintenance operations and those special areas within the Project Area. The potential interactions and effects of drilling activities for Project Area Tiebacks would be the same as those assessed for the Core BdN Development. As noted in Section 7.2.3.2, based on drill cuttings dispersion modelling, it is estimated that geographic extent associated with drill cuttings in shallower waters of the Project Area would be approximately 13 km² per well template. Assuming, conservatively, there are three tiebacks in shallower waters and two in deeper waters, the total seabed area potentially affected by drilling in the Project Area is estimated to be 40 km², or approximately 1 percent of the 4,015 km² of special areas within the Project Area. Cumulatively, a conservative estimate of the potential seabed area affected by drilling for the Core BdN Development (2.5 km² estimate; see above) and from Project Area Tiebacks (40 km²) would be 42.5 km², or approximately 1 percent of the special areas within the Project Area.

The potential interactions and effects of supply and servicing for Project Area Tiebacks would be the same as those assessed for the Core BdN Development. The characterization of interactions and effects from support surveys presented for the Core BdN Development would be the same for the Project Area should Project Area Tiebacks occur.

At end of field-life, the Project will be decommissioned in accordance with regulatory requirements in place at the time of decommissioning. The timeframe for decommissioning, whether at the end of the Core BdN Development or at the end of Project life is anticipated to be the same. The interactions and associated effects, due to the decommissioning of subsea infrastructure would be the same as for the Core BdN Development.

7.5.4 Mitigation Measures

Key mitigation measures that will be integrated into the Project to help avoid or reduce potential environmental effects on Special Areas include:

- 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 five or more corals in 100 m² with heights greater than 30 cm within 100 m of the discharge location.

- Where Project activities may affect fish habitat, and it is determined through DFO's "Request for Review" process pursuant to the *Fisheries Act* that a *Fisheries Act* Authorization is required, a habitat offsetting program will be developed in conjunction with DFO and in consultation with Indigenous Groups and stakeholders 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 OWTG (NEB et al. 2010) and regulatory discharge limits, the use of best treatment practices for discharges associated with the Project 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 OCSG (NEB et al. 2009) and Equinor Canada's chemical selection and screening processes.
- Marine discharges (e.g., bilge water) will be treated in accordance with MARPOL and Canadian requirements prior to discharge
- 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 anti-fouling paint on hull of FPSO
- Use of common traffic routes for vessels and helicopters will be used where possible and practicable
- Helicopter flight paths and 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 2019), mitigation measures applied during the Project's geophysical surveys where air source arrays are used will be consistent with those outlined in the SOCP (DFO 2007). This includes implementing a shut down of the air source array(s) when SAR listed as Endangered or Threatened on Schedule 1 of SARA (as well as all beaked whale species) are detected within the safety zone during anytime air sources are active, including ramp up.
- Shut-down of air source arrays for all beaked whales when detected within safety zone
- Equinor Canada will develop a marine mammal and sea turtle monitoring plan for 4D seismic surveys which will be provided to Fisheries and Oceans Canada (DFO) for review and input
- 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.

- If Equinor Canada is aware of a Project vessel striking a marine mammal or sea turtle, the Equinor Canada will inform DFO through their 24-hour emergency contact number (1-888-895-3003).
- Communications and notifications of Project activities, as applicable, with commercial fisheries and other ocean users (see Section 13.1.5.2 of the EIS 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.
- At the time of decommissioning, all surface facilities (e.g., FPSO, turret, anchor lines) will be removed.
- 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.

7.5.5 Significance of Residual Effects

As described in the previous VC sections, 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. The Project is also unlikely to have significant adverse effects on the Commercial Fisheries and Other Ocean Uses (see below). As a result, the Project activities will not contribute to a detectable adverse change in one or more of the important and defining ecological and sociocultural characteristics of Special Areas that would result in a decrease in its overall integrity, value and use.

Therefore, it is predicted that the Project will not result in significant adverse effects on Special Areas. This conclusion has 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.

7.6 Commercial Fisheries and Other Ocean Uses

Commercial Fisheries and Other Ocean Uses have been identified and included as a VC for this EIS due to the economic and socio-cultural importance of commercial fishing and other marine activities to NL and other jurisdictions that are known to undertake these activities off eastern NL, and the associated potential for interactions between these ocean users and Project-related components and activities during the temporal scope of the Project.

Commercial fishing is a key economic activity within NL and the surrounding areas. Fisheries within the eastern NL offshore area are extensive and diverse, involving a range of participants, species, gear types and other characteristics at various times of the year. This includes fishing activity by Canadian enterprises and vessels, primarily within Canada’s 200 NM EEZ, and by both Canadian and non-Canadian fishers outside of the EEZ. A range of other anthropogenic components and human activities occur throughout the marine environment offshore eastern NL, including other marine shipping and transportation, marine tourism, other oil and gas exploration and production,

military exercises and in situ submarine infrastructure, such as communication cables, shipwrecks and unexploded ordnance (UXO). Like commercial fisheries, these have economic, strategic and/or security importance within the region and beyond and are also considered collectively as part of this VC.

7.6.1 Existing Conditions

Fish harvesting typically occurs where the targeted species have been harvested in the past and are therefore known to occur, which tends to make harvesting locations fairly consistent from year to year. Figure 7-4 identifies the location data for domestic commercial fishing activity in relation to the Core BdN Development Area, the Project Area, the LSA (including the vessel traffic route) and the RSA. The information presented includes data for all months of all years from 2011 to 2016, aggregated for all species and gear types. Cells in the figures are colour coded to provide an indication of relative fishing intensity based on the number of harvesting records at each cell location: green represents areas with relatively lower numbers of records and yellow to red indicates where more fishing activity reports occurred. Based on this data, there is limited domestic harvesting of fish species within the Core BdN Development Area, but a higher level of harvesting in the western area, and to some extent the northern area, of the Project Area. In addition to domestic harvesting, the Project Area, LSA and RSA waters have long been harvested by vessels from other nations (Amec 2014), particularly in those areas beyond the EEZ and primarily within the NAFO Regulatory Area around and near the Flemish Cap and southward to the “Tail” of the Grand Banks (Figure 7-5). Although comprising a smaller part of the overall harvest in the RSA, foreign fishery activity is an important presence in the western and northern areas of the Project Area, with limited to no fishing in the Core BdN Development Area.

The timing of most fisheries depends on many factors, such as open and closed management seasons, market cycles, individual fishing enterprise business priorities, the availability of the targeted resource at the time (depending on migration patterns and other influences), and the weather. Most domestic harvesting in both the LSA and the RSA is concentrated in the April to August period, though the RSA typically records relatively more activity in the winter months than does the LSA. This is also the case for foreign harvesting in the NAFO Regulatory Area, where a substantial level of activity continues throughout the year. Some fisheries in the RSA (such as shrimp and several groundfish fisheries) are open year-round until quotas are taken, while others (e.g. snow crab) have a more well-defined and relatively shorter open season, usually within the April to July period in the RSA.

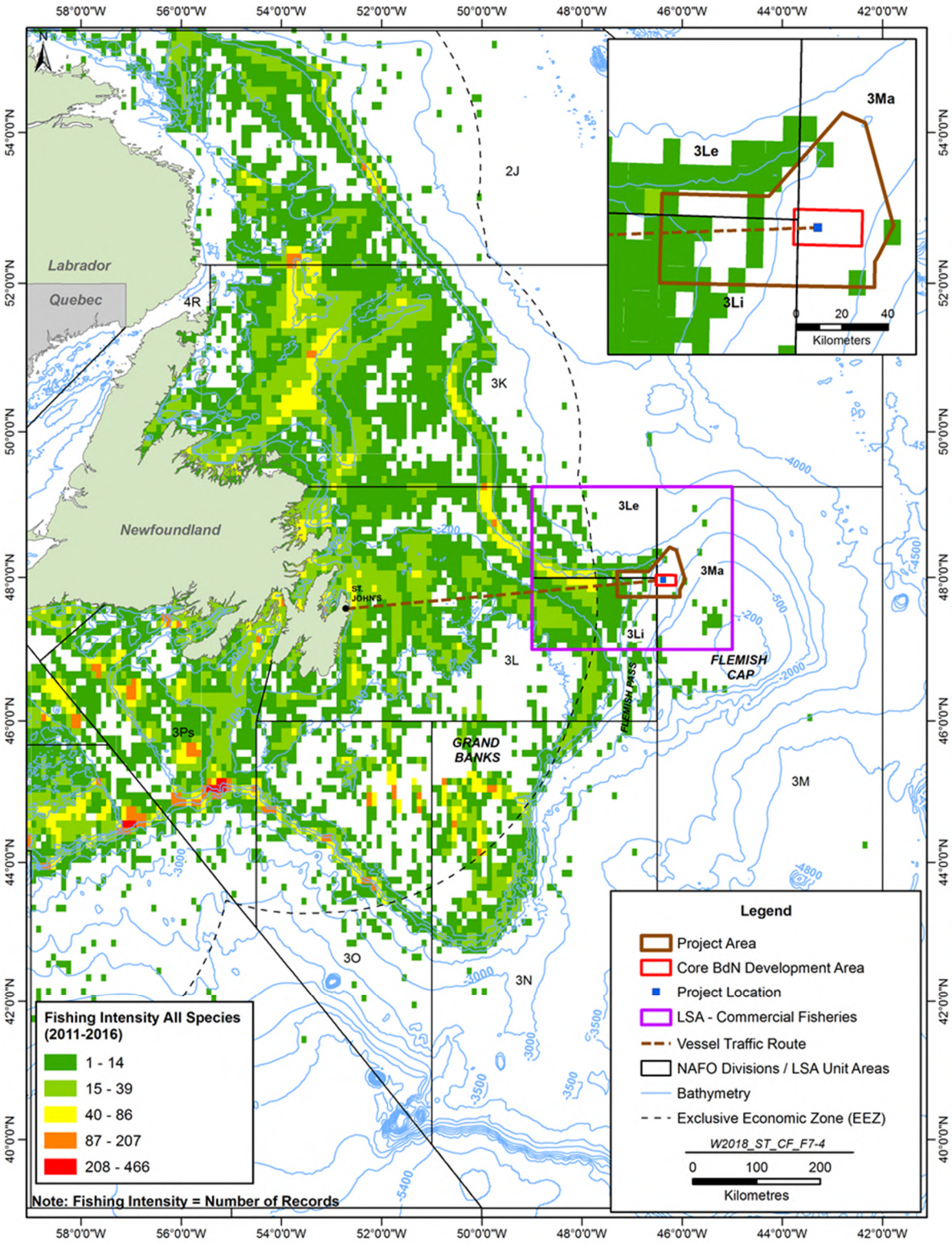


Figure 7-4 Domestic Commercial Harvesting Locations and Intensity, All Species, All Gear Types, All Months 2011 to 2016

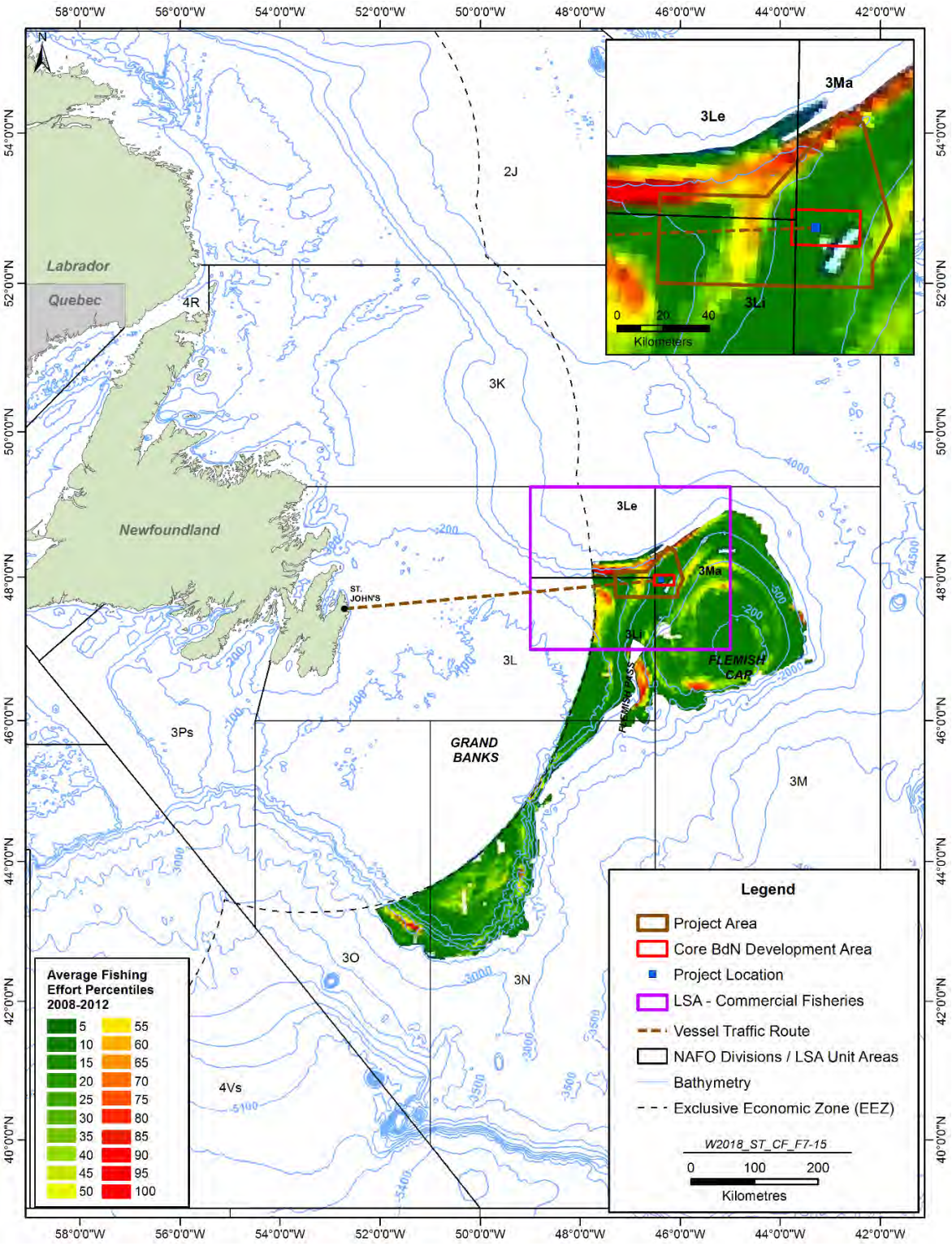


Figure 7-5 NAFO Regulatory Area Foreign and Domestic Fishing Effort Locations and Intensity 2008 to 2012

Fisheries science programs in support of stock assessments and fisheries management decisions may occur within the Project Area, LSA and the RSA. These surveys are conducted by DFO and/or fishing industry groups, and the locations and timing of these studies vary depending on the subjects being investigated from year to year. In addition to fisheries-related research, the potential also exists for other research to be conducted in offshore NL during certain times of the year.

With respect to marine vessel traffic, the Project Area is in an area that has relatively low-density vessel activity. There are some higher-density areas around the Flemish Cap and Flemish Pass that are likely attributable to commercial fishing activity and commercial marine traffic. There is a high density of vessel traffic to the south of the vessel traffic route, which is associated with supply and servicing for the existing production operations on the Grand Banks and international vessel movements across the Atlantic Ocean. There is a higher concentration of vessel traffic closer to shore, where shipping lanes merge near the mouth of St. John's Harbour and along the coastline of NL.

The Royal Canadian Navy and Air Force routinely conduct training exercises and surveillance operations throughout Atlantic Canada, including the waters offshore NL. These operations include the use of marine patrols and aircraft off eastern NL, within the RSA and potentially the Project Area. There are offshore legacy sites where UXO may remain, as well as shipwrecks. While some of these sites occur along the marine vessel traffic route (with no potential for interaction), there are no known sites with the Project Area (Defence Construction Canada 2016).

Oil and gas exploration and development is an established and important industry offshore NL. Production activities for oil and gas have been occurring in the region since 1997, with activities related to exploration taking place since 1963. As of November 2018, 466 wells have been drilled, including 171 exploration wells, 57 delineation wells and 240 development wells (C-NLOPB 2018). This has led to more than 55 SDLs and 12 Production Licenses issued in offshore NL. A large concentration of drilling activity has occurred along the Grand Banks within the RSA. Seismic survey activity has also been common in offshore NL and has been increasing in recent years.

With respect to other marine infrastructure, there is one active and one inactive subsea cable within the Project Area (DFO 2015). There would be no interaction between subsea cables and vessels moving through the vessel traffic route.

7.6.2 Potential Changes to the Environment

The assessment of Project-related environmental effects on Commercial Fisheries and Other Ocean Users is focused on the following potential environmental effects and associated potential environmental changes:

- Direct interference caused by the Project with fish harvesting and other marine activities, resulting in a change in the distribution, intensity, function, and/or value of Commercial Fisheries and Other Ocean Uses
    - Loss of access to localized marine areas due to the anti-collision zone associated with the presence the FPSO and/or drilling installation(s)

  - Temporary interference / disruption of fishing or fisheries surveys, or actual or perceived loss of access to fishing grounds necessitating altered vessel routes or movement to alternative grounds
  - This might affect the efficiency of harvesting with consequent lower catches and/or revenues, lost time and additional operating costs
  - Associated interference / disruption of other shipping (including other petroleum exploration)
  - Avoidance of subsea infrastructure by future commercial activities

- Damage caused by the Project to fishing gear, vessels and other existing subsea infrastructure, and associated loss of catch and income for harvesters or other marine operators
  - Project activities may result in damage to fishing gear or vessels if they come into direct contact with subsea infrastructure Project vessels and survey equipment, and components may tangle or foul fishing gear
  - Possible damage to subsea cables or other objects / artifacts; UXO / legacy site interaction

- Change in abundance, distribution and quality of marine resources, resulting in a change in the distribution, intensity, function, and/or value of Commercial Fisheries and Other Ocean Uses
  - A potential change in the abundance, distribution and availability of commercial fish species on established grounds due of Project activities (e.g., sound and other emissions) may result in diminished fishing success (e.g., lower catches and revenues, lost time, additional operating costs)
  - A change in the (real or perceived) quality of marine resources has a potential to result in lower market demand and/or commercial prices

7.6.3 Potential Effects

7.6.3.1 Core BdN Development

The primary interactions associated with Core BdN Development and Commercial Fishing and Other Oceans Uses include loss of access to fishing grounds due to the establishment of anti-collision zones that would be required for the FPSO and when a drilling installation is on site; potential for gear damage from subsea infrastructure; and the potential change in abundance, distribution and quality of marine resources associated with additional geophysical surveys.

Direct interference with fishing activity is a potential effect associated with offshore construction and installation of subsea infrastructure activities, and the continued presence of the subsea infrastructure. However, as mentioned above, fishing within Core BdN Development Area has been very limited and it is anticipated that fishing and other vessel traffic will also continue to be very low. Furthermore, there is an FCA that intersects the Core BdN Development Area where fishing is closed to bottom trawling activities. Therefore, there is limited potential for interactions between fishing activities and installation of subsea infrastructure. Trawl protection is being considered in the design

of subsea infrastructure, thereby reducing potential for snagging or damaging trawling gear. The likelihood of gear or vessel damage will also be reduced with notification of the safety zone, which delineates the area occupied by subsea infrastructure, so that fishing vessels and other ocean users, which might have planned to pass through the area can take alternative routes when transiting through the Flemish Pass. The footprint of the subsea infrastructure is approximately 7 km² or less than 0.001 percent of the LSA. In addition, Equinor Canada will provide appropriate regulatory authorities the coordinates of the safety zone for addition to marine navigational charts and will communicate these coordinates to NAFO and One Ocean. Based on the small footprint of the subsea infrastructure, in comparison to available fish harvesting areas within the larger LSA, and the limited to no harvesting in the Core BdN Development Area, there will likely be little to no potential for interference with fishing activity and little to no displacement of harvesters from currently active fishing areas and will not result in financial losses to fish harvesters.

Anti-collision zones would be established once the FPSO is on location and would remain in effect until the FPSO leaves the area at the time of decommissioning. The anti-collision zone for the FPSO is approximately 8.5 km² and is an area where fishing and other marine traffic is not permitted. An 8.5 km² anti-collision would represent less than 2 percent of the Core BdN Development Area, less than 0.2 percent of the Project Area and approximately 0.01 percent of the LSA. While the presence of the anti-collision zone will result in loss of access to the area by fish harvesters, the Core BdN Development Area has a history of little to no domestic or foreign harvesting, based on DFO and NAFO data. Therefore, the presence of the anti-collision zone for the FPSO is not anticipated to interfere with domestic or international harvesting activities. Based on the small size of the anti-collision zone in comparison to available fish harvesting areas within the larger LSA, and the limited to no harvesting in the Core BdN Development Area, there will likely be little to no displacement of harvesters from currently active fishing areas and will not result in financial losses to fish harvesters.

For other surface marine traffic, the presence of subsea infrastructure will not have potential for interaction (e.g., with freighters, tankers, cruise ships, other oil and gas exploration), as active work areas will be easily avoidable, considering the use of NAVWARN and other at-sea communications.

As noted in Section 7.2.3.1, underwater sound emissions from geophysical surveys has the potential to affect fish behaviour and avoidance of certain areas, and therefore has the potential to indirectly affect commercial fishing activity. Fish avoidance behaviours could reduce catch rates of fish areas where geophysical surveys are undertaken, therefore resulting in lower economic returns for fishers. Overall, while there may be behavioural response of fish to sound from geophysical surveys, the indirect effects to Commercial Fisheries and Other Ocean Uses is expected to be unlikely due to the transient, localized, and short-term nature of the surveys, particularly since the surveys will be conducted in the Core BdN Development Area where past harvesting and science surveys have been very low to none.

NAFO fisheries studies are conducted by some individual signatory states, and locations and timing vary depending on the matter being investigated from year to year. Domestic fisheries science surveys are not known to occur within the Core BdN Development Area. Communication with NAFO, through DFO, regarding Project activities will reduce potential for interference given the availability of other nearby areas fish harvesting and scientific surveys. Standard marine notification protocols will allow for fishing and other vessels to adjust course, if needed, without economic loss or other

interference. Military operations that might be in the area will be informed of Project marine activities through the specific point of contact for Department of National Defence (DND).

One active subsea communications cable passes through the Project Area, outside the Core BdN Development Area. No shipwrecks or military Legacy Sites are known within the Project Area (though there is one legacy site near the vessel traffic route); however, undocumented artifacts including UXO may be present. In the case of a suspected UXO being identified, it will be reported to DND.

Other potential interactions (e.g., lighting, marine discharges, produced water, drill cuttings discharges) have negligible to low interactions with fish and prey species (see Chapter 9) and it is predicted that there would be no significant residual adverse effect on Marine Fish and Fish Habitat. Considering the marketability / saleability of fish from the general area (the Project Area or the LSA), resulting specifically from market perceptions that would affect price and reduce economic returns, this has not been recorded in relation to other production facilities and operations in the NL region and is anticipated to be similar for the BdN Project operations.

The primary interaction associated with decommissioning would be the decommissioning of subsea infrastructure. If subsea infrastructure were removed, the area would return to baseline conditions and would no longer interfere with commercial fish harvesting. If subsea infrastructure were left in place, all flowlines would be flushed. Water depths are approximately 1,100 m, so there may be interference with fish trawling activities that occur at this water depth. However, based on historical fishing data, and with the FCA in the Core BdN Development Area, the fishing activity in this area is very low to no fishing activity. NAVWARNs and Notices to Mariners would be issued and the coordinates of any remaining subsea infrastructure will be provided to NAFO, One Ocean, FFAW-Unifor, DFO and regulatory agencies (for inclusion on marine navigational charts).

7.6.3.2 Project Area Tiebacks

The primary interaction associated with Project Area Tiebacks would be the same as those for the Core BdN Development, as discussed above. However, there is a potential for an increased level of interaction with commercial fisheries if Project Area Tiebacks occur in areas with higher fishing intensity than in the Core BdN Development Area, for instance in the western and northern area of the Project Area. Mitigations measures implemented during Core BdN Development activities would continue for activities undertaken during Project Area Tiebacks.

As noted above, assuming five tiebacks were undertaken, each at separate locations, the footprint of the five tiebacks is estimated to be approximately 15 km², which represents approximately 0.02 percent of the LSA. Considering the footprint of the Core BdN Development Area the total footprint for subsea infrastructure in the Project area would be approximately 22 km², representing approximately 0.03 percent of the LSA. Overall, subsea infrastructure would represent a very small area of the available fish harvesting areas within the LSA. If activities were to occur in the larger Project Area, the potential for interaction with fishing activity and with fisheries science surveys would be greater than for the Core BdN Development Area. For instance, a tieback in the northwest of the Project Area, towards the shallower waters of the Sackville Spur in NAFO UAs 3Le or 3Ma, or west towards the Nose of the Grand Banks, could place subsea infrastructure in areas used more frequently by domestic and international fishers (based on the available DFO and NAFO data). These

are principally bottom trawling for the same groundfish species as in the Core BdN Development Area, though in the past the Area harvesting has included shrimp trawling, and likely would again if this fishery is reopened during the potential 30-year life of the Project. As in the Core BdN Development, a safety zone will be established within the Project Area and may be an extension of the Core BdN Development Area safety zone. Standard marine notification protocols will allow for vessels to adjust course, as needed, without operational interference. Equinor Canada, will inform fisheries interests and other ocean users of planned activities through NAVWARNs and ongoing communications with One Ocean and DFO (regarding communications to NAFO). Once the safety zone is established for the subsea infrastructure, Equinor Canada will provide appropriate regulatory authorities the coordinates of the safety zone for addition to marine navigational charts and will communicate these coordinates to NAFO and One Ocean.

When the drilling installation is on-site, a temporary (one to two years) anti-collision zone of approximately 1 km² would be established around the installation. As noted above, the establishment of an anti-collision zone prohibits other marine users, including fish harvesters from entering the zone. Therefore, if the drilling installation is in an area of the Project area where fishing intensity is higher (i.e., in the northwest areas of the Project Area, towards the shallower waters of the Sackville Spur in NAFO UAs 3Le or 3Ma, or west towards the Nose of the Grand Banks) than in the Core BdN Development Area, there is a greater potential for direct interference with commercial fishing activity and marine transportation than assessed in the Core BdN Development Area. Overall, a 1 km² anti-collision zone for a drilling installation represents a very small area of available fishing areas within the LSA. As noted above, Equinor Canada will communicate presence of the anti-collision zone to fish harvesters and marine users.

Although some fisheries activities (including science surveys) have a potential to be affected by Project activities depending on their location and timing in relation to fish harvesting, effects from Project activities, based on the discussion above, are predicted to be negligible for the Core BdN Development Area and low should Project Area Tiebacks occur in the Project Area. Overall, effects will be localized to occur within the Core BdN Development Area or the Project Area, where fishing activity is very low to low, respectively, than in adjacent areas within the LSA, affecting a very small portion of the available fishing grounds. For other marine operators, slight alterations of course to avoid Project activities will be possible. No known existing subsea infrastructure would be affected during any phase of Project activities. Other described mitigation measures, communications with fishers and other ocean users, will further mitigate potential effects on this VC.

With the Project's adherence to relevant standards and guidelines for waste management and emissions, as described in Chapter 9, it is not predicted that the significant biophysical effects will occur for fish or fish habitat, or that the quality or marketability of commercial harvests will be affected.

7.6.4 Mitigation Measures

Key mitigation measures that will be integrated into the Project to help avoid or reduce potential environmental effects on Commercial Fisheries and Other Ocean Users include:

- Common traffic routes for vessels and helicopters will be used where possible and practicable.
- The use of obstruction lights, navigation lights, and foghorns on board the FPSO and drilling installation(s).
- Equinor Canada is evaluating the need for subsea infrastructure protection for flowlines. In determining the need for protection measures, the level and types of historical fishing effort in the Project and Core BdN Development Area will be considered. Options for trawl protection will be in consideration of Equinor's global experience.
- Equinor Canada will provide appropriate regulatory authorities the coordinates of the safety zone and/and or anti-collision zone for addition to marine navigational charts
- Ongoing communication with commercial fishers through FFAW-Unifor and seafood producers regarding planned Project activities, including notification of coordinates of safety and/or anti-collision zones.
- Ongoing communications with the NAFO Secretariat, through DFO as the Canadian representative, regarding planned Project activities, including timely communication of the anti-collision and/or safety zones
- Ongoing communication with regulatory agencies to share information regarding the timing and location of activities (e.g., DFO research surveys, DND offshore military exercises)
- Equinor Canada will engage with DND to determine appropriate communication protocols regarding Project activities
- Equinor Canada will develop and implement a compensation program for damages or losses in consideration of the Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activities (C-NLOPB 2017) and aligned with the Best Practices Document for Compensation Processes and Procedures that One Ocean is currently preparing.
- In consideration with the Risk Management Matrix Guidelines (One Ocean n.d.(a)), the need for a Fisheries Liaison Officer (FLO) and/or fisheries guide vessels during drilling installation movement from a NL port to its offshore location will be determined in consideration of the guidelines.
- Equinor Canada will implement a standard marine communication protocol to promote safe practices between commercial fishing enterprises, other marine users and BdN operations. The protocol will be in accordance with the Protocols for Communication with Oil Installations on the Grand Banks (One Ocean n.d.(b)), which outlines communication requirements upon approach to the safety zone.
- Issuance of NAVWARNS (formerly Notices to Shipping) and Notices to Mariners (where appropriate) regarding planned Project activities.

- 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.
- Upon final decommissioning, if applicable, the communication through Notices to Mariners and DFO for inclusion on nautical charts, of the locations of subsea infrastructure that may be left in the Project Area.

7.6.5 Significance of Residual Effects

In consideration of the present knowledge of Commercial Fisheries and Other Ocean Uses within the Project Area, and with the application of mitigation measures, it is predicted that the Project will not result in significant adverse effects on Commercial Fisheries and Other Ocean Uses.

This prediction is based on a good understanding of the relevant areas' fisheries, adjacent science surveys and other marine components and activities in the area, and the general effects that the many past oil and gas exploration and production projects in the Atlantic Canadian offshore have had on such activities. The primary mechanism of interaction that may have adverse effects on this VC is the presence of the FPSO and/or drilling installation(s) and their associated anti-collision zones, the presence of subsea infrastructure, and vessel traffic. The establishment of anti-collision zones does not create an economic loss to harvesters or other marine operators. While there will be a small decrease in the area available for harvesting, work activities within the Project Area will represent a very small geographical portion of the overall LSA and RSA. It is therefore not anticipated that the Project will cause a detectable reduction in the overall value of activities pursued by Commercial Fisheries and Other Ocean Uses or result in economic loss. Furthermore, it is not anticipated that the Project will cause a detectable reduction in the overall nature, intensity, location or timing of current marine-based activities within the LSA for a community or region.

7.7 Indigenous Peoples

Indigenous Peoples was selected as a VC in recognition of the cultural, social, and economic importance of marine life (fish, migratory birds and marine mammals) and harvesting to Indigenous peoples, the requirements of the EIS Guidelines, and in recognition of potential or established Aboriginal and treaty rights. This chapter assesses and evaluates the potential environmental effects of the Core BdN Development and Project Area Tiebacks on this VC. A key focus of this analysis is on assessing and evaluating the potential for the Project, and the various changes to the environment that may be associated with it, to interact with and affect Indigenous communities and/or groups and their activities, with specific reference to each of the socio-cultural aspects identified in Section 5(1)(c) of CEAA 2012, as well as interactions with potential or established Indigenous rights.

7.7.1 Existing Conditions

Section 5 of the EIS Guidelines directs Equinor Canada to engage with 41 Indigenous groups (refer to Section 5 of this summary for a listing of these groups) and to provide information on baseline

conditions of these identified groups to facilitate an assessment of Project effects upon any potential or established Aboriginal or treaty rights under section 35 of the *Constitution Act, 1982*.

It is Equinor Canada's understanding that none of the listed Indigenous groups has asserted or established Aboriginal or treaty rights protected by section 35 of the *Constitution Act, 1982* (Section 35 rights) in or to the lands and waters of eastern offshore NL where the Project components and activities will be located. The Project components and activities will be located at a considerable distance from Indigenous groups (approximately 640 km to 2,000 km from the various Indigenous communities) and many of their harvesting activities and other known interests. However, the various Indigenous groups identified in the EIS Guidelines have asserted or established section 35 rights to harvest for FSC purposes or to earn a moderate livelihood in their traditional territories. Various groups hold commercial-communal fishing licences for NAFO areas that overlap with the Project. In addition, migratory species (including fish, birds and mammals) that move through the Flemish Pass may potentially be affected by Project activities and these species may be harvested by Indigenous groups in coastal areas through FSC fishing, commercial-communal fishing or through other harvesting activities.

Indigenous peoples have historically relied on harvesting a variety of species (e.g., fish, birds, marine mammals, wildlife, plants) for sustenance, medicine, spiritual and cultural practices, and for trade. Indigenous people continue to engage in traditional land and resource use practices though the location, species and methods of harvesting may have changed over time.

In Canada, Section 35 rights to harvest for FSC purposes or to earn a moderate livelihood have been affirmed in various Supreme Court of Canada decisions, such as the "Sparrow decision" (1990), and the "Marshall decision" (1999). DFO issues two types of communal fishing licenses to Indigenous groups: FSC and commercial-communal. These licenses are held under the name of the Indigenous community, not under the name of a specific individual. Traditional harvesting (including FSC fishing) is an important component of Indigenous culture and sustenance, and central to community social and ceremonial activities. Revenue from commercial-communal licences is used to provide programs and services in Indigenous communities.

Commercial fishing activity occurs throughout the RSA, with shrimp, snow crab, and groundfish as the key species harvested. Within the Project Area, fisheries that are most likely to occur include harvesting groundfish, such as Atlantic redfish, Atlantic cod, Greenland halibut and American plaice. Large pelagic fisheries (swordfish and sharks) may also occur in the area or nearby waters. Before the closures in 3L and 3M, northern shrimp trawling was also an important fishery. Indigenous groups hold commercial-communal licences to harvest some of these species within the RSA. NL Indigenous groups hold licences for capelin, groundfish, herring, mackerel, seal, shrimp, snow crab, tuna and whelk though the rights to these resources may not be currently exercised. Commercial fishing activities, including those carried out under commercial-communal licences by Indigenous groups, may potentially intersect with the Project Area. Indigenous groups from the Maritime provinces hold commercial-communal licences for swordfish and tuna in NAFO subdivisions including 3LMNO. Fourteen of the Maritime groups hold swordfish and/or tuna licences in NAFO divisions that overlap with the Project Area. An additional seven hold licences for these species in unspecified areas and thus may potentially include NAFO divisions off eastern NL.

Harp, grey, hooded and ringed seals are harvested in commercial-communal fisheries by Indigenous groups in NL. Sealing generally occurs between late March and mid-May; but harvesting can vary by species and other environmental factors and biological conditions (DFO 2011a). Ringed seal is the most commonly harvested species by the Inuit (DFO 2011b). Hooded seals are also important to subsistence harvesters.

The various Indigenous groups listed in Section 5 of this summary undertake land and resource use activities including fishing, harvesting, and trapping in inland and coastal areas throughout Atlantic Canada. While harvesting activities are often undertaken for personal and family sustenance, natural resources hold additional importance to Indigenous peoples because harvesting, consumption, and sharing country foods are integral to Indigenous spiritual beliefs, cultural practices, and community life. Many species including fish, shellfish, seals, whales, and migratory birds are harvested throughout the RSA. Based on available information, and as emphasized throughout engagement with Indigenous groups for this Project, two fish species (i.e., Atlantic salmon and American eel) have been identified as being of particular concern due to their importance to Indigenous groups for cultural reasons and the potential for interaction between these migratory species and Project activities. Migratory and marine birds and marine mammals (seals) have also been identified as being of importance to various Indigenous groups for food, social or cultural purposes.

7.7.2 Potential Changes to the Environment

The assessment of Project-related environmental effects on Indigenous Peoples is focused on the following potential environmental effects and associated potential environmental changes:

- Change in commercial-communal fisheries
  - Direct or indirect loss in availability of commercial-communal fisheries resources arising from Project activities
- Change in current use of lands and resources for traditional purposes
  - Direct or indirect loss in availability of fish and other marine- associated resources (migratory birds and marine mammals), which are traditionally harvested, arising from Project activities

7.7.3 Potential Effects

7.7.3.1 Core BdN Development

Most Project-related activities will take place in an offshore marine environment, hundreds of kilometres from land and approximately 640 km to 2,000 km from Indigenous communities and their traditional territories. No Indigenous group has asserted or established Aboriginal or treaty rights in the Core BdN Development Area, the Project Area or the LSA. There are no documented instances of traditional harvesting within or near the Core BdN Development Area, Project Area or LSA and no current use of lands and resources for traditional purposes in any of these areas. There are no known sites of historical, archaeological, paleontological or architectural significance to Indigenous groups in the Core BdN Development Area, the Project Area or the LSA.

Various Indigenous groups hold commercial-communal licences for a variety of species, including swordfish and tuna, in NAFO Divisions 3L and 3M, portions of which overlap the Project Area. There is no recorded domestic commercial or commercial-communal harvesting in the Core BdN Development Area. Similarly, the level of commercial harvesting in the Project Area is low and concentrated in the western and northern portions. The extent of commercial-communal fishing in the Project Area is not known as available datasets do not distinguish between Indigenous and non-Indigenous commercial harvesting. However, no Indigenous group has indicated any commercial-communal fishing activity currently in the Project Area. While some NL and Maritime Indigenous groups hold swordfish / tuna licences, there were no recorded landings of either swordfish or tuna in the Project Area between 2011 and 2016. Most harvesting of these species is undertaken well south of the Project Area and the range and migrations of both swordfish and tuna make it unlikely that there would be any interaction with planned Project activities. The potential Project effects on commercial-communal harvesting generally (including commercial-communal harvesting in the RSA outside the Project Area) have been discussed with Indigenous groups during engagement activities and no major concerns were expressed. If in future, commercial-communal harvesting occurs in the Core BdN Development Area or the Project Area, given the nature of the Project, including its limited and localized environmental disturbances, and associated mitigation measures (e.g. notification), any residual Project effects upon Indigenous commercial-communal fisheries with respect to either the licenced activity or commercially-harvested species would be the same as those experienced by non-Indigenous commercial fishers (see Section 7.6 and Chapter 13 of the EIS).

Given that routine Project-related activities will occur in the marine environment at a range of approximately 640 km to 2,000 km from the various Indigenous communities and their traditional territories, no direct effects on the physical or social health and well-being or economic conditions of Indigenous groups or communities are predicted. Routine Project activities are also not predicted to result in changes to the environment that would indirectly adversely affect the human health and well-being or socio-economic conditions of Indigenous groups or communities.

The identified Indigenous groups currently undertake traditional land and resource harvesting activities in their traditional territories which are generally near their communities. Potential adverse effects on marine-associated resources used by Indigenous groups for traditional purposes or otherwise are of cultural value are limited to possible effects on marine species that may migrate through the Flemish Pass prior to arriving in harvesting areas. The presence of such species in the Project Area is limited and the biological VC chapters (Chapters 9 to 11 of the EIS) respecting marine and migratory species have determined that the Project is not likely to result in significant residual adverse effects upon marine fish, marine or migratory birds, or marine mammals and sea turtles.

The various mitigation measures identified throughout the EIS will help avoid or reduce associated effects on these species. While it is not possible to determine with absolute certainty whether an individual of any species (in any life history stage) used by one or more of these Indigenous groups may be present in the Project Area before moving to an area that is the subject of traditional harvesting activity (particularly for juvenile stages of some species with extensive dispersion), the potential is extremely remote for any degree of connection between individuals within the Project Area and those harvested for traditional purposes. As a result, the Project is not anticipated to have an adverse effect on the availability or quality of resources that are currently used for traditional

purposes, especially in a manner or to a degree that would alter the overall nature, frequency, location, timing, quality or cultural value of current land and resource use activities for traditional purposes. Therefore, no effects upon the current use of lands and resources for traditional purposes by Indigenous groups are predicted. Since no effects on the current use of lands and resources for traditional purposes are predicted, the Project will have no effects upon asserted or established Aboriginal or treaty rights.

Similarly, routine Project activities are not predicted to result in effects on the socio-economic conditions of the various Indigenous communities. Given the location of Project activities and the distance from Indigenous communities, routine activities are not predicted to interact with on-land or near-shore Indigenous activities that contribute to the socio-economic conditions and well-being of Indigenous communities. Since residual effects on Marine Fish and Fish Habitat, including species harvested for traditional purposes, are determined to be not significant, no associated potential effects to socio-economic conditions such as employment and business activity and income, community revenue, community-based services and infrastructure, and availability of culturally important species in the Indigenous communities are predicted. With the application of mitigation measures and adherence to published and/or industry standards and best management practices, no effects from routine Project activities on Indigenous groups and their activities are predicted.

7.7.3.2 Project Area Tiebacks

Project Area Tiebacks are not predicted to result in changes to the environment that would indirectly adversely affect the human health and well-being or socio-economic conditions of Indigenous groups or communities. Project Area Tiebacks will have no effects on traditional land and resource harvesting activities in their traditional territories. Project Area Tiebacks will have no effects on the current use of lands and resources for traditional purposes; therefore, Project Area Tiebacks will have no effect upon asserted or established Aboriginal or treaty rights. Any potential interactions and residual effects of Project Area Tiebacks upon Indigenous commercial-communal fisheries with respect to either the licenced activity or commercially harvested species would be the same as those identified and assessed for the Core BdN Development.

7.7.4 Mitigation Measures

Key mitigation measures that will be integrated into the Project to help avoid or reduce potential environmental effects on Indigenous Peoples include those measures identified in Section 7.6.4 to mitigate Project-related effects on commercial fisheries.

7.7.5 Significance of Residual Effects

It is predicted that, with the application of mitigation measures, the Project will not result in significant adverse effects on Indigenous Peoples.

As stated previously, there is no domestic commercial or commercial-communal fishing currently in the Core BdN Development Area and overall levels of commercial fishing in the Project Area are low. If, in future, commercial-communal fishing occurs in this area, the primary mechanism of interaction

that may have direct adverse effects on commercial-communal fisheries would be the presence of the FPSO, associated subsea infrastructure, drilling installation(s), the establishment of anti-collision zones, and vessel traffic. As discussed previously, given the localized nature of Project infrastructure and its small physical footprint, and the availability of alternative fishing grounds, even were commercial-communal fishing activities to occur in the Core BdN Development Area, the presence of Project components and associated anti-collision zones would not have any direct effect on the commercial-communal harvest (in terms of catch rates, employment and revenue) and no detectable effect on the economy or well-being of an Indigenous community.

The environmental effects analysis indicates there is limited potential for marine-associated species that are known to be traditionally harvested by, or of cultural importance to, the identified Indigenous groups to occur in or pass through the Core BdN Development Area before moving to an area of traditional harvesting. The implementation of the mitigation measures outlined throughout the EIS will reduce direct potential effects on these resources and any associated effects upon their availability, quantity, quality or economic value for traditional activities. The Project is not anticipated to adversely alter the overall nature, frequency, location or timing of current use of lands and resource for traditional purposes by one or more Indigenous groups or result in any effects upon health and well-being or cultural or socio-economic conditions. No effects upon the exercise of Aboriginal or treaty rights (asserted or established) are predicted.

7.8 Cumulative Effects

As required under Section 19(1) of CEAA 2012, the EIS assesses and evaluates cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out, as well as the significance of these potential effects. As further discussed below, it is predicted that the Project will not result in significant adverse cumulative environmental effects on the VCs in combination with other projects and activities that have been or will be carried out in the RSA.

7.8.1 Approach and Methods

The cumulative effects assessment considers the overall total effect on the VCs as a result of the Project's predicted residual effects and those of other relevant projects and activities in the RSA. In terms of scope, the assessment focusses on the same set of VCs as those considered in the Project-specific effects assessment, as these represent the components of the environment that may interact with and be adversely affected by the Project, and thus, upon which the Project and its effects may contribute to cumulative effects within the spatial and temporal boundaries under consideration.

The following ongoing and potential future projects and activities were considered in this cumulative effects assessment:

- Offshore petroleum production projects (Hibernia and extension, Terra Nova, White Rose and extensions, Hebron) – these projects range from 180 km to 229 km from the Core BdN Development Area
- Geophysical survey programs (15 different programs by multiple proponents)

- Exploration drilling programs (eight different programs by multiple proponents)
- Fishing activity
- Other marine vessel traffic
- Other harvesting activity

The cumulative effects assessment considers the predicted residual environmental effects of the Project and their potential accumulation and interaction in space and time with those of other past, ongoing, and future projects and activities. Past and ongoing projects and activities and their environmental effects are reflected in the existing baseline environmental conditions for each VC. The current condition of the VC as a result of natural and anthropogenic factors, and its overall sensitivity or resiliency to further disturbance or change, has been considered in a fully integrated manner throughout the environmental effects assessments. The cumulative effects assessment considers how this existing environmental condition may be changed by the Project, and then, whether and how the effects of other ongoing and future projects and activities that have a high degree of certainty (i.e., will be executed or carried out) would affect the same VCs through direct overlap in space and time and/or by affecting the same individuals or populations. This includes predicting the likely nature and degree of the potential effects of this Project on the VC, as well as potential effects resulting from other, multiple sources of future environmental interactions. Where available and applicable, the assessment uses relevant scientific, engineering, community, stakeholder, and Indigenous knowledge and perspectives.

7.8.2 Marine Fish and Fish Habitat

Table 7.2 summarizes the results of the cumulative effects assessment for this VC. The Project will not result in significant adverse cumulative environmental effects on Marine Fish and Fish Habitat (including SAR) in combination with other projects and activities that have been or will be carried out. The relative contribution of the residual effects of the Project to cumulative effects on this VC within the overall RSA is predicted to be low.

Table 7.2 Summary of Potential Cumulative Environmental Effects: Marine Fish and Fish Habitat

Summary of Potential Cumulative Environmental Effects	
VC Existing Condition (Past and Ongoing Activities)	• Habitats in the RSA are used by fish and invertebrate species of commercial, cultural, ecological, and/or conservation importance, and support regionally important areas of biodiversity and marine productivity. • Fish presence and abundance for secure species and SAR affected by directed commercial fisheries and bycatch, as well as oceanographic conditions. • Fishing pressures along with oceanographic conditions continue to influence fish distribution and abundance in the Project Area and overall region. Overall, due to warming conditions, groundfish have been recovering on the Grand Banks with a decline in groundfish prey species.

Table 7.2 Summary of Potential Cumulative Environmental Effects: Marine Fish and Fish Habitat

Summary of Potential Cumulative Environmental Effects	
Residual Environmental Effects of the Project	• The Project may result in residual changes in habitat availability and quality; food availability and quality; mortality, injury, or health (physical effects); and/or presence and abundance (behavioural effects) for Marine Fish and Fish Habitat, including secure species and SAR. With the application of mitigation measures, these potential residual adverse effects are predicted to be not significant and the Project is not expected to result in overall ecological or population-level effects on Marine Fish and Fish Habitat. • This prediction is made with a moderate to high level of confidence.
Other Projects / Activities	**Potential for Interaction with Effects of Project**
Hibernia	Operations are located well outside of the Project Area and LSA, with highly localized environmental effects as determined from ongoing EEM programs.
Terra Nova	Operations are located well outside of the Project Area and LSA, with highly localized environmental effects as determined from ongoing EEM programs.
White Rose and Extension Project	Operations are located well outside of the Project Area and LSA, with highly localized environmental effects as determined from ongoing EEM programs.
Hebron	Operations are located well outside of the Project Area and LSA. Based on its Comprehensive Study Report and other existing EEM programs, it is anticipated that Hebron will have localized environmental effects suggesting there is no potential for interaction.
Offshore Petroleum Exploration – Geophysical and Other Exploration Activities	Some potential for interaction, although localized and short-term nature of these activities and their effects, along with planned and required separation measures and other mitigation measures, will reduce potential for interaction.
Offshore Petroleum Exploration – Drilling	Some potential for interaction, although localized and short-term nature of these activities and their effects, along with planned mitigation measures, will reduce potential for interaction.
Fishing Activity	Some potential for interaction, although these activities occur primarily in select parts of the Project Area only, mostly outside of the Core BdN Development Area. Safety zones around Project activities will limit the potential for overlapping and concurrent environmental effects, and thus, for cumulative effects on this VC.
Other Marine Vessel Traffic	Some potential for interaction, although these activities and their effects are highly localized and transient
Other Harvesting Activity	These harvests are primarily in inshore waters with limited spatial overlap with the Project area or vessel traffic route. These activities and their effects are highly localized and transient.
Cumulative Effects Summary	Project components and activities are not likely to result in significant residual adverse cumulative environmental effects on Marine Fish and Fish Habitat in combination with other projects and activities that have been or will be carried out in the RSA.

7.8.3 Marine and Migratory Birds

Table 7.3 summarizes the results of the cumulative effects assessment for this VC. The Project is not likely to result in significant adverse cumulative environmental effects on Marine and Migratory Birds (including SAR) in combination with other projects and activities that have been or will be carried out. The relative contribution of the residual effects of the Project to cumulative effects on this VC within the overall RSA is predicted to be low.

Table 7.3 Summary of Potential Cumulative Environmental Effects: Marine and Migratory Birds

Summary of Potential Cumulative Environmental Effects	
VC Existing Condition (Past and Ongoing Activities)	• Offshore NL provides important habitat for tens of millions of marine and migratory birds. Several major seabird colonies are also found along the Newfoundland coastline, and species that do not breed in the area are drawn to the Grand Banks for foraging throughout the year. • In general, the populations of most marine-associated bird species occurring off eastern Newfoundland are considered secure overall, although one species, the Leach's storm-petrel, has seen declines in recent years.
Residual Environmental Effects of the Project	• The Project may result in residual changes in habitat availability and quality, food availability and quality, avifauna presence and abundance (behavioural effects) and/or morality / injury levels and health for Marine and Migratory Birds, including secure species and SAR. These potential residual effects are predicted to be not significant and the Project is not expected to result in overall ecological or population-level effects on Marine and Migratory Birds. • This prediction is made with a moderate to high level of confidence.
Other Projects / Activities	**Potential for Interaction with Effects of Project**
Hibernia	Operations are located well outside of the Project Area and LSA, with highly localized environmental effects.
Terra Nova	Operations are located well outside of the Project Area and LSA with highly localized environmental effects.
White Rose and Extension Project	Operations are located well outside of the Project Area and LSA, with highly localized environmental effects.
Hebron	Operations are located well outside of the Project Area and LSA, with highly localized environmental effects.
Offshore Petroleum Exploration – Geophysical and Other Exploration Activities	Some potential for interaction, although localized and short-term nature of these activities and their effects, along with required separation measures and other mitigation measures, will reduce potential for interaction.
Offshore Petroleum Exploration – Drilling	Some potential for interaction, although localized and short-term nature of these activities and their effects, and other mitigation measures, will reduce potential for interaction.

Table 7.3 Summary of Potential Cumulative Environmental Effects: Marine and Migratory Birds

Summary of Potential Cumulative Environmental Effects	
Fishing Activity	Some potential for interaction, although these transient activities occur in select parts of the Project Area only, primarily outside of the Core BdN Development Area. Vessel and aircraft traffic and associated discharges (including fish offal) and emissions could have cumulative effects on habitat quality and food availability, although these would be minor due to the spatially and temporally limited nature of these effects.
Other Marine Vessel Traffic	Some potential for interaction, although these activities and their effects are highly localized and transient. Vessel and aircraft traffic and associated emissions could have cumulative effects on habitat quality and food availability, but these would be minor due to the spatially and temporally limited nature of these effects.
Other Harvesting Activity	Harvesting pressure could potentially result in cumulative changes in mortality / injury to murres and, to a lesser extent, waterfowl.
Cumulative Effects Summary	Project components and activities are not likely to result in significant residual adverse cumulative environmental effects on this VC in combination with other projects and activities that have been or will be carried out in the RSA

7.8.4 Marine Mammals and Sea Turtles

Table 7.4 summarizes the results of the cumulative effects assessment for the Marine Mammal and Sea Turtle VC. The Project is unlikely to result in significant adverse cumulative environmental effects on Marine Mammals and Sea Turtles (including SAR) in combination with other projects and activities that have been or will be carried out. The relative contribution of the residual effects of the Project to cumulative effects on this VC within the overall RSA is generally predicted to be low for most marine mammal species and for sea turtles. However, there is some uncertainty associated with this prediction, particularly for a scenario involving concurrent Project activities and geophysical surveys with additional non-project geophysical surveys (possibly two or more) near the Project Area.

Table 7.4 Summary of Potential Cumulative Environmental Effects: Marine Mammals and Sea Turtles

Summary of Potential Cumulative Environmental Effects	
VC Existing Condition (Past and Ongoing Activities)	• Species that occur in the RSA may experience cumulative effects from the Project in combination with other projects and activities include: 23 species of cetaceans, of which 7 are mysticetes (baleen whales) and 16 are odontocetes (toothed whales); 4 species of phocids (seals); and 2 species (possibly 4) of sea turtles. • While some of these species are migratory, others may be present in the Project Area and adjacent areas year-round. • Eleven of these species are SAR listed under Schedule 1 of SARA or have been identified as SOCC by COSEWIC. • EBSAs, some of which represent important foraging habitat and migratory routes for Marine Mammals and Sea Turtles, intersect the RSA. • There is no overlap with designated critical habitat for marine mammals or sea turtles in the Project Area or RSA.

Table 7.4 Summary of Potential Cumulative Environmental Effects: Marine Mammals and Sea Turtles

Summary of Potential Cumulative Environmental Effects	
	• There are indications that the Sackville Spur area is regularly used by northern bottlenose whales and Sowerby's beaked whales. It is uncertain whether these areas provide important habitat to these beaked whale species (and secure marine mammals species like sperm whales).
Residual Environmental Effects of the Project	• The Project may result in residual changes in habitat quality or use, prey availability or quality, health, and/or injury levels for Marine Mammals and Sea Turtles, including secure species and SAR. Changes in mortality level are considered highly unlikely. These potential residual effects are predicted to be not significant and the Project is not expected to result in overall ecological or population-level effects on Marine Mammals and Sea Turtles. • This prediction is generally made with a moderate level of confidence given that there are uncertainties in predicting the effects of the Project on Marine Mammals and Sea Turtles (refer to Section 11.5 of the EIS). More specifically, there is uncertainty as to whether the Project Area or certain portions of the Project Area are regularly used and important foraging areas, migratory corridors, and/or breeding areas for marine mammals—particularly northern bottlenose whales.
Other Projects / Activities	**Potential for Interaction with Effects of Project**
Hibernia	Continuous underwater sound and other environmental disturbances are generated by the production facility and attending supply vessels. Transient sound is generated by associated shuttle tankers and supply vessels transiting to and from Hibernia. There will be limited potential for cumulative effects of the Project due to the separation distances between the Project Area and Hibernia (i.e., approximately 157 km). It is also unlikely that short-term and localized effects experienced by a marine mammal at Hibernia would lead to additive cumulative effects for that individual that may move to the Project Area. Sea turtles are considered uncommon at Hibernia and rare in the Project Area.
Terra Nova	Continuous underwater sound and other environmental disturbances are generated by the FPSO and attending supply vessels. Transient sound is generated by associated shuttle tankers and supply vessels transiting to and from Terra Nova. There will be limited potential for cumulative effects of the Project due to the separation distances between the Project Area and Terra Nova (i.e., approximately 166 km). It is also unlikely that short-term and localized effects experienced by a marine mammal at Terra Nova would lead to additive cumulative effects for that individual that may move to the Project Area. Sea turtles are considered uncommon at Terra Nova and rare in the Project Area.
White Rose and Extension Project	Continuous underwater sound and other environmental disturbances are generated by the FPSO and attending supply vessels. Transient sound is generated by associated shuttle tankers and supply vessels transiting to and from White Rose. There will be limited potential for cumulative effects of the Project due to the separation distances between the Project Area and White Rose (i.e., approximately 118 km). It is also unlikely that short-term and localized effects experienced by a marine mammal at White Rose would lead to additive cumulative effects for that individual that may move to the Project Area. Sea turtles are considered uncommon at White Rose and rare in the Project Area.

Table 7.4 Summary of Potential Cumulative Environmental Effects: Marine Mammals and Sea Turtles

Summary of Potential Cumulative Environmental Effects	
Hebron	Continuous underwater sound and other environmental disturbances are generated by the production platform and attending supply vessels. Transient sound is generated by associated shuttle tankers and supply vessels transiting to and from Hebron. There will be limited potential for cumulative effects of the Project due to the separation distances between the Project Area and Hebron (i.e., approximately 160 km). It is also unlikely that short-term and localized effects experienced by a marine mammal at Hebron would lead to additive cumulative effects for that individual that may move to the Project Area. Sea turtles are considered uncommon at Hebron and rare in the Project Area.
Offshore Petroleum Exploration – Geophysical and Other Exploration Activities	Underwater sound generated by geophysical surveys (especially concurrent seismic surveys) near the Project Area, particularly in deep waters, has the potential for cumulative effects (avoidance and masking) on marine mammals. There is limited potential for auditory injury, particularly given mitigation measures that will be implemented (as per the SOCP). The effects of a single geophysical seismic survey are expected to result in localized and temporary behavioural effects on marine mammals (and sea turtles which may occur in the area); however, there is some uncertainty in how marine mammals will respond to potentially, multiple concurrent seismic surveys.
Offshore Petroleum Exploration – Drilling	Continuous underwater sound and other environmental disturbances are generated by the drilling installation and attending supply vessels. Behavioural effects are predicted to be localized and short-term particularly given the relatively low source level and attenuation of drilling sound at short ranges to levels below measured ambient levels. In addition, it is unlikely that short-term and localized effects experienced by a marine mammal (and sea turtle) during exploration drilling would lead to additive cumulative effects for an individual that may move to the Project Area.
Fishing Activity	Marine mammals and sea turtles may be affected by commercial fishing activities through entanglement in fishing gear resulting in mortality or injury. Marine mammals and sea turtles may exhibit localized and short-term avoidance of fishing vessels. Given that the Project is not expected to result in mortality or injury to marine mammals and sea turtles, there is limited potential for this type of cumulative effect. There is some potential for cumulative effects from underwater sound from fishing vessels and Project activities. However, this potential is reduced because fishing activities occur in select parts of the Project Area only, primarily in the western and northern section, outside of the Core BdN Development Area, and the number of fishing vessels active in the area at a given time is limited. Additive or synergistic cumulative behavioural effects on this VC are unlikely. It is also unlikely that short-term and localized behavioural effects experienced by a marine mammal or sea turtle near a fishing vessel outside of the Project Area would lead to additive cumulative effects for that individual that may move to the Project Area.

Table 7.4 Summary of Potential Cumulative Environmental Effects: Marine Mammals and Sea Turtles

Summary of Potential Cumulative Environmental Effects	
Other Marine Vessel Traffic	Underwater sound generated from vessel traffic may result in changes in behaviour and there is increased risk of vessel strikes resulting in mortality or injury. Given that the Project is not expected to result in mortality or injury to marine mammals and sea turtles, there is limited potential for this type of cumulative effect. There is potential for cumulative behavioural effects from underwater sound from marine traffic and Project activities. However, this potential is reduced because the Project Area is distant from major shipping routes to North America as well as the primary shipping route into St. John's (see Figure 7-45 of the EIS). Additive or synergistic cumulative behavioural effects on this VC are unlikely. It is also unlikely that short-term and localized behavioural effects experienced by a marine mammal near a transiting vessel outside of the Project Area would lead to additive cumulative effects for that individual that may move to the Project Area.
Other Harvesting Activity	Seal harvesting (harp and hooded seals) in nearshore areas of the RSA will result in mortalities. Given that the Project is not expected to result in mortality or injury to seals, there is very limited potential for this type of cumulative effect.
Cumulative Effects Summary	Project components and activities are not likely to result in significant residual adverse cumulative environmental effects on this VC in combination with other projects and activities that have been or will be carried out in the RSA. There is a moderate level of confidence with this effects prediction particularly regarding the effects of underwater sound from multiple exploration activities and Project activities on marine mammals in and near the Project Area.

7.8.5 Special Areas

Table 7.5 summarizes the results of the cumulative effects assessment for Special Areas. The Project is not likely to result in significant adverse cumulative environmental effects on Special Areas in combination with other projects and activities that have been or will be carried out. The relative contribution of the residual effects of the Project to cumulative effects on this VC is predicted to be low.

Potential cumulative effects on biological / ecological aspects and human use related to Special Areas have also been addressed in the other VCs considered in this chapter. Implementation of the various environmental mitigation procedures outlined throughout the EIS, including those which are designed to avoid or reduce Project-related discharges and/or disturbances and their associated environmental effects, will also serve to help address potential Project-related contributions to cumulative effects on Special Areas.

Table 7.5 Summary of Potential Cumulative Environmental Effects: Special Areas

Summary of Potential Cumulative Environmental Effects	
VC Existing Condition (Past and Ongoing Activities)	• Various types of Special Areas are located within the RSA, including coastal and marine areas protected through legislation or formally identified as being special or sensitive. • Many of these Special Areas in the RSA are in mid-shore, nearshore and onshore areas. These include provincial ecological reserves, parks and protected areas and historic sites, Canadian MPAs, Marine Refuges, fisheries closures within the EEZ, national parks and historic sites, EBSAs, MBSs, as well as international designations such as IBAs and World Heritage Sites. • Several types of Special Areas are in the LSA within the offshore environment as well as offshore to coastal areas of the LSA surrounding the vessel traffic route. These include Canadian crab fishery closures, EBSAs, national historic sites, and provincial Seabird Ecological Reserves. Several international Special Areas, including a UNCBD EBSA, VMEs and NAFO FCAs, intersect with the LSA.
Residual Environmental Effects of the Project	• The Project may result in residual changes in environmental features and/or processes and/or human use and/or societal value of Special Areas. These potential residual effects are predicted to be not significant and the Project is not expected to result in significant residual adverse effects on the overall and defining physical, biological, and socio-economic environments within Special Areas. • These predictions were made with a moderate to high level of confidence.
Other Projects / Activities	**Potential for Interaction with Effects of Project**
Hibernia	Special Areas do not overlap with the Hibernia project.
Terra Nova	Special Areas do not overlap with the Terra Nova project.
White Rose and West White Rose Project	Special Areas do not overlap with the White Rose project.
Hebron	Special Areas do not overlap with the Hebron project.
Offshore Petroleum Exploration - Geophysical and Other Exploration Activities	Some potential for interaction, although localized and short-term nature of these activities and their effects, along with planned and required separation measures will reduce potential for interaction.
Offshore Petroleum Exploration – Drilling	Some potential for interaction, although localized and short-term nature of these activities and their effects, along with planned and required separation measures will reduce potential for interaction.
Fishing Activity	Fishing activity occurs throughout the offshore area. Fishing activity and ELs that may be drilled as part of this Project both overlap with portions of the Northeast Shelf and Slope EBSA.

Table 7.5 Summary of Potential Cumulative Environmental Effects: Special Areas

Summary of Potential Cumulative Environmental Effects	
Other Marine Vessel Traffic	Some potential for interaction, although these activities and their effects are highly localized and transient. Anti-collision zones around Project activities will limit interactions and thus cumulative effects on this VC.
Other Harvesting Activity	No harvesting activity within Special Areas offshore, nor targeting key species relevant to their designations.
Cumulative Effects Summary	Project components and activities are not likely to result in significant residual adverse cumulative environmental effects on this VC in combination with other projects and activities that have been or will be carried out in the RSA.

7.8.6 Commercial Fisheries and Other Ocean Uses

Table 7.6 summarizes the results of the cumulative effects assessment for the Commercial Fisheries and Other Ocean Uses VC. The Project is not likely to result in significant adverse cumulative environmental effects on this VC in combination with other projects and activities that have been or are likely to be carried out. The relative contribution of the residual effects of the Project to cumulative effects on the VC is therefore predicted to be low.

Table 7.6 Summary of Potential Cumulative Environmental Effects: Commercial Fisheries and Other Ocean Uses

Summary of Potential Cumulative Environmental Effects	
VC Existing Condition (Past and Ongoing Activities)	• Commercial fishing and other ocean activity occurs regularly – some year-round – throughout the Grand Banks, the Labrador Shelf and adjacent waters including around the Flemish Cap and to a lesser extent within the Core BdN Development Area and Project Area. • Key species currently harvested within the RSA are snow crab and groundfish (most areas), shrimp (now only in northern areas) and deep-sea clams (mainly in southern areas), as well as more limited quantities of large and small pelagic species. • Within the Project Area the principal fished species are groundfish, primarily harvested with bottom trawls. • Domestic fishing activity is most common from April to September, while foreign fishing effort is year-round. • Routine activities to date have not resulted in negative effects to the quality or marketability of fisheries resources. • Domestic and foreign fisheries science surveys may occur annually in many parts of the RSA and the LSA, and potentially within the Project Area. • Other ocean use activity (other research, shipping, military exercises) also occur throughout the Project Area and LSA. • OSVs, including shuttle tankers, are active year-round transiting in common routes to and from the existing production facilities. • Oil and gas exploration activities occur throughout the RSA, LSA and possibly in the Project Area

Table 7.6 Summary of Potential Cumulative Environmental Effects: Commercial Fisheries and Other Ocean Uses

Summary of Potential Cumulative Environmental Effects	
	• The RSA also encompasses other submarine artifacts and infrastructure such as trans-Atlantic and regional communication cables, shipwrecks, military legacy sites and possible UXO. Within the Project Area there are two communications cables (one active and one abandoned) but no other known subsea artifacts
Residual Environmental Effects of the Project	• The Project may result in loss of access to localized areas, potential interference with marine activities, including fishing and fishing gear damage, changes in commercial species abundance, quality or market perception, or physical damage to existing infrastructure or other artifacts. • Considering the relatively low level of recorded activities in the Project Area, and with the implementation of mitigation measures the Project is predicted not to result in significant residual adverse effects on this Commercial Fisheries or Other Ocean Uses. • This prediction is made with a high level of confidence.
Other Projects / Activities	**Potential for Interaction with Effects of Project**
Hibernia	Operations are located well outside of the Project Area and LSA, with localized environmental effects.
Terra Nova	Operations are located well outside of the Project Area and LSA, with localized environmental effects
White Rose and Extension Project	Operations are located well outside of the Project Area and LSA, with localized environmental effects.
Hebron	Operations are located well outside of the Project Area and LSA, with localized environmental effects.
Offshore Petroleum Exploration – Geophysical and Other Exploration Activities	There is a potential for cumulative interactions between the Project and other exploration activities within the LSA and/or RSA through temporary loss of access and increased marine traffic associated with these activities. Although there is some potential for interaction with fish harvesting and other marine activities, the localized and short-term nature of these activities and their effects, along with planned mitigations and required separation measures, will reduce the potential for interaction.
Offshore Petroleum Exploration – Drilling	Offshore oil and gas exploration drilling activity may occur within the RSA, including the LSA There is a potential for cumulative interactions between the Project and other exploration drilling activities within the Project Area through loss of access and increased marine traffic. Although there is some potential for interaction, localized and short-term nature of these activities and their effects, along with planned measures will reduce potential for interactions with commercial fisheries.
Fishing Activity	N/A
Other Marine Vessel Traffic	Vessel traffic from other marine industries could increase in the RSA. Increases in marine traffic may result in damage to fishing gear and equipment. There is some potential for interaction, although these activities and their effects are highly localized and transient. The potential for cumulative interaction effects will be reduced through ongoing communication with other ocean users and use of the vessel traffic route.
Other Harvesting Activity	Operations are located well outside of the Project Area, with localized environmental effects.

Table 7.6 Summary of Potential Cumulative Environmental Effects: Commercial Fisheries and Other Ocean Uses

Summary of Potential Cumulative Environmental Effects	
Cumulative Effects Summary	Project components and activities are not likely to result in significant residual adverse cumulative environmental effects on Commercial Fisheries and Other Ocean Uses in combination with other projects and activities that have been or will be carried out in the RSA.

7.8.7 Indigenous Peoples

Table 7.7 summarizes the results of the cumulative effects assessment. The Project, in combination with other known projects and activities that have been or will be carried out, is not likely to result in significant adverse cumulative environmental effects on this VC. The relative contribution of the residual effects of the Project to cumulative effects on this VC is predicted to be low.

Table 7.7 Summary of Potential Cumulative Environmental Effects: Indigenous Peoples

Summary of Potential Cumulative Environmental Effects	
VC Existing Condition (Past and Ongoing Activities)	• The EIS Guidelines for the Project identify Indigenous groups in NL, the Maritime provinces (Nova Scotia, New Brunswick, Prince Edward Island), and Québec that have the potential to be affected by Project activities. • Other past and ongoing projects (Table 15.3 of the EIS) and activities in eastern Canada may have interacted with Indigenous communities and activities, and other components and interests of individual Indigenous groups. • Section 7.3 of the EIS discusses socio-economic components, including traditional land use, physical and cultural heritage and health and socio-economic conditions related to Indigenous groups in the RSA. • The Project Area is not within the traditional territory of any of the Indigenous groups. There are no sites, structures or things of historical, archaeological, paleontological or architectural significance overlap with the Project Area. • There is no current use of lands and resources for traditional purposes occurs in the LSA, Project Area or Core BdN Development Area. • The Indigenous communities are located between 640 km and 2,000 km from the Project Area. • Commercial-communal fishing is important for employment and revenue that funds community development and social programs and services • Indigenous groups hold commercial-communal fishing licences for a variety of species, including swordfish and tuna, in NAFO 3L and 3M, portions of which overlap the Project Area. • There is no recorded commercial-communal fishing in the Core BdN Development Area and no recorded landings of swordfish or tuna in the Project Area between 2011 and 2016. • No Indigenous group has indicated that commercial-communal fishing is conducted in the Project Area.

Table 7.7 Summary of Potential Cumulative Environmental Effects: Indigenous Peoples

Summary of Potential Cumulative Environmental Effects	
Residual Environmental Effects of the Project	• The Project will not result in residual adverse effects on - any structure, site or thing that is of historical, archaeological, paleontological or architectural significance - physical and cultural heritage - the current use of lands and resources for traditional purposes • The Project will have no residual effects upon the exercise of Aboriginal or treaty rights • The Project may result in residual adverse effects on commercial-communal fisheries. These residual effects are predicted to be not significant • With the application of proposed Project-related mitigation and environmental protection measures, the residual environmental effects on Indigenous Peoples, including health and socio-economic conditions are predicted to be not significant.
Other Projects / Activities	**Potential for Interaction with Effects of Project**
Hibernia	There is some potential for interaction. Operations are located at a substantial distance from the Project Area and may have localized environment effects. The anti-collision zone may interact cumulatively regarding available fishing areas, but the area will be very small in comparison to the overall fishing areas in the RSA. Offshore oil and gas production activities may also interact with commercially harvested due to the generation of underwater sound and water quality effects associated with discharges. Transiting marine vessels may also cause mortality of marine mammals due to vessel strikes. However, these effects are generally not expected to be of sufficient magnitude, duration, or extent to affect catch rates or otherwise cause a change in commercial-communal fisheries.
Terra Nova	There is some potential for interaction. Operations are located at a substantial distance from the Project Area and may have localized environment effects. The exclusion zone may interact cumulatively regarding available fishing areas, but the area will be very small in comparison to the overall fishing areas in the RSA. Offshore oil and gas production activities may also interact with commercially harvested due to the generation of underwater sound and water quality effects associated with discharges. Transiting marine vessels may also cause mortality of marine mammals due to vessel strikes. However, these effects are generally not expected to be of sufficient magnitude, duration, or extent to affect catch rates or otherwise cause a change in commercial-communal fisheries.
White Rose and Extension Project	There is some potential for interaction. Operations are located at a substantial distance from the Project Area and may have localized environment effects. The anti-collision zone may interact cumulatively regarding available fishing areas, but the area will be very small in comparison to the overall fishing areas in the RSA. Offshore oil and gas production activities may also interact with commercially harvested due to the generation of underwater sound and water quality effects associated with discharges. Transiting marine vessels may also cause mortality of marine mammals due to vessel strikes. However, these effects are generally not expected to be of sufficient magnitude, duration, or extent to affect catch rates or otherwise cause a change in commercial-communal fisheries.

Table 7.7 Summary of Potential Cumulative Environmental Effects: Indigenous Peoples

Summary of Potential Cumulative Environmental Effects	
Hebron	There is some potential for interaction. Operations are located at a substantial distance from the Project Area and may have localized environment effects. The anti-collision zone may interact cumulatively regarding available fishing areas, but the area will be very small in comparison to the overall fishing areas in the RSA. Offshore oil and gas production activities may also interact with commercially harvested due to the generation of underwater sound and water quality effects associated with discharges. Transiting marine vessels may also cause mortality of marine mammals due to vessel strikes. However, these effects are generally not expected to be of sufficient magnitude, duration, or extent to affect catch rates or otherwise cause a change in commercial-communal fisheries.
Offshore Petroleum Exploration – Geophysical and Other Exploration Activities	Although there is some potential for interaction, the localized and short-term nature of these activities and their effects, along with planned and required separation measures will reduce potential for interaction.
Offshore Petroleum Exploration – Drilling	Some potential for interaction, although localized and short-term in nature. There is potential for cumulative interactions between the Project and other exploration activities through increased marine traffic and loss of access associated with anti-collisions zones but these areas will be very small in comparison to the overall fishing areas in the RSA. Although some potential for interaction, localized and short-term nature of these activities and their effects, along with mitigation measures will reduce potential for interaction.
Fishing Activity	N/A
Other Marine Vessel Traffic	There is some potential for interaction, although these activities and their effects are highly localized and transient. Marine vessel traffic from various industries could increase in the Project Area over the temporal scope of the Project. Increase in marine traffic may result in increased risk of damage to fishing gear and equipment. Marine mammals may be affected by vessel strikes.
Other Harvesting Activity	There is no potential for interaction as non-commercial harvesting does not occur in the Project Area.
Cumulative Effects Summary	Project components and activities are not likely to result in significant residual adverse cumulative environmental effects on Indigenous Peoples in combination with other projects and activities that have been or will be carried out in the RSA.

7.9 Accidental Events

This section addresses accidental spills to the marine environment that could occur during drilling and production activities. Equinor Canada's commitments and procedures for spill prevention and response are presented to provide context for the spill risk and probability analysis, as well as the fate and behavior analysis that are used to inform the assessment of environmental effects of accidental spills on VCs.

7.9.1 Spill Prevention and Response

Equinor Canada maintains a strong commitment to safe, secure, and sustainable operations. Central to this commitment is a corporate Safety and Sustainability management system. Equinor Canada developed a management system to capitalize on the collective knowledge and best practice gained over many years, ensuring activities are conducted in a safe, secure, and sustainable manner and risks are effectively managed. Equinor Canada's emergency management philosophy is to prevent spills from happening, and in the unlikely event a spill would occur, to reduce the impact of an emergency on people, environment, and the integrity of Equinor Canada, contractor, and third-party assets.

Equinor Canada recognizes that prevention is the most effective way to avoid environmental effects from accidental spills. Facilities, processes, and management system procedures are intended and designed to reduce or eliminate the chance of a spill, even in the case of equipment failure, during all potential hydrocarbon handling operations. Routine maintenance and testing schedules will be established for all aspects of Project activities, with particular attention paid to process facilities, well control, product storage and handling, fuel transfer systems, and crude offloading. Prior to offshore activities commencing, practices and limits for operating in poor weather, high sea state, or sea ice or iceberg conditions will be established. Good communications and sound marine practices for all vessels will also improve the ability to prevent spills.

The Project will use preparedness processes including meteorological (weather forecasting and monitoring) and physical environmental (ice monitoring and installation instrumentation) to monitor for and respond to extreme environmental events. These processes may be used to identify the potentially threatening iceberg conditions under which precautionary riser / turret disconnection is required, or the forecasted storm conditions under which precautionary down-staffing should occur.

Proper environmental operating practices will be assured through regular inspections and audits of the drilling installation and FPSO. The general awareness of offshore workers will be increased through training, workshops, and health, safety and environment meetings, including specific training in oil spill prevention, reporting and response requirements, and procedures.

Oil spill prevention is a key focus of Equinor Canada's plans and activities. 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 OSRP, which will be submitted to the C-NLOPB as part of the OA application process.

7.9.2 Summary of Key Mitigation Measures – Accidental Events

Equinor Canada will undertake a SIMA as part of the OSRP during the OA approval process with the C-NLOPB. The SIMA is a structured process that evaluates benefits and drawbacks of different response tactics, considering feasibility and effectiveness of implementation in different spill scenarios and prevailing conditions, compared to no action. The SIMA will inform the selection of overall spill response strategy for the Project.

Equinor Canada will develop and implement a compensation program for damages resulting from Project activities, including spill events. This compensation program will be developed in consideration of the C-NLOPB Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activities (2017) and will be aligned with the Best Practices Document for Compensation Processes and Procedures that One Ocean is currently preparing.

In the unlikely event of an accidental event such as a significant spill or a blowout, event-specific environmental monitoring programs may be required, which will be developed and implemented in consultation with the appropriate regulatory agencies.

7.9.3 Accidental Events Scenarios

The following spill scenarios were selected for detailed spill fate and behaviour modelling, and effects assessment, based on consideration of Project activities and potential environmental risk.

- Subsurface blowouts - two locations in Project Area
- Batch crude spills - various sizes, surface and subsurface
- Batch diesel spill
- SBM whole mud spill - two locations in Project area, surface and subsurface
- Vessel-to-vessel collision – in vessel traffic route

These scenarios are considered representative of credible worst-case spill scenarios that could result from an accidental event.

7.9.3.1 Subsurface Blowouts – Model Summary

The spill trajectory modelling included two analyses – stochastic and deterministic. The accidental events environmental effects assessment for each VC uses the representative worst-case from all subsurface blowout modelling scenarios, which is the representative deterministic 95th percentile for surface oiling, water column exposure and contact with shoreline. The 95th percentile case is selected from 171 or 172 model runs (36-d or 115-d scenarios, respectively) that capture the seasonal and annual variability in currents, winds, and ice cover. While the stochastic analysis provides insight into the probable behaviour of oil releases given historic wind and current data for the Project Area, the deterministic analysis provides individual trajectory, oil weathering information, expected concentrations or thicknesses of oil contamination, mass balance, or other information related to a single release at a given location and time. Therefore, the data provided by the deterministic modelling are more representative of the potential extent of a spill and is therefore used in the effects assessment.

The extremely unlikely and unmitigated subsurface blowouts at Sites 1 and 2 are predicted to result in large areas where hydrocarbons at the surface are predicted to exceed the conservative ecological and socio-economic thresholds. For the unmitigated spill event, these areas are predicted to extend to the Flemish Pass, Flemish Cap, Orphan Basin, southern Grand Banks and associated slope waters. Modelling results indicate that the areas with total hydrocarbon (THC) water column concentrations exceeding the ecological threshold are predicted to include the slopes of the Grand Banks, the Flemish Pass, the Flemish Cap and areas northeast of the release site. At the end of the

160-day modelling simulations, it was predicted that most of the remaining oil evaporated (47 to 51 percent) and degraded (29 to 36 percent). Approximately 0.3 to 8 percent was predicted to remain at the surface, 1 to 3 percent remained entrained in the water column, 0 to 2 percent was predicted to make contact with the shore, and less than 0.01 percent remained in the sediment. Between 9 to 15 percent left the model domain.

Modelling predicted that between 5.6 and 22.92 percent of the total release volume could leave the model domain. Based on stochastic modelling (with 171 or 172 individual trajectories throughout the year and over multiple years), it always took greater than 25 days, and typically greater than 50 days for oil to leave the model domain. At this time, the oil would be highly weathered (i.e., the more toxic components of oil are the lighter more volatile ends that would have evaporated, dissolved, and degraded over time), thereby reducing the toxicity of the residual oil. It would be present as patchy and discontinuous emulsified oil and/or tarballs. At the end of 160 days, oil outside the model domain would be dispersed to the point that average thicknesses over this area would be at a level of dull brown sheen or thinner. Upon review of comparable spill modelling in recent EIS reports, in which the model domain included areas to the east of the BdN spill model domain, the predictions on the fate and effects of BdN crude for areas to the east of the BdN model domain can be made. A recent EIS submitted by CNOOC (CNOOC 2018) regarding exploration drilling used a larger model domain, extending from 35°N to 60°N and 72°W to 15°W. Although there are differences in the simulated releases between CNOOC and BdN, they are similar enough to draw general conclusions. The CNOOC EIS predicted the highest probability of oil reaching the Azores where shoreline exceeded the 1 g/m² was 70 and 77 percent (depending on scenario) in the summer months. The modelled 95th percentile representative deterministic shoreline scenario predicted a minimum time for oil to reach the Azores at was between 80 days and 111 days, depending on the spill site. Therefore, oil that is predicted to make shore would be highly weathered, patchy, and discontinuous. Surface oiling is predicted to occur to the areas to the east of the spill sites at thicknesses >0.04 µm in areas beyond NAFO division 3LMN.

For the representative worst-case scenarios for shoreline oiling, less than 1 percent of the total volume released was predicted to make contact with the shoreline of NL. Most of the oil that was predicted to make contact occurred on the Avalon Peninsula and localized areas of the Burin Peninsula. First contact with shoreline occurred within 14 to 15 days (115-day scenario) or at day 45 (36-day scenario). In both cases, oil would be highly weathered (i.e., lighter and more toxic components would have evaporated, dissolved, and degraded thereby reducing the toxicity of the residual oil), patchy and discontinuous (refer to Appendix E of the EIS for further details). In these extremely low probability cases, the THC concentration on shore was predicted to exceed 500 g/m², which was above the socio-economic (1 g/m²) and ecological (100 g/m²) thresholds.

The subsurface releases were predicted to result in both dissolved and THC concentrations in the water column that exceeded the identified thresholds. Concentrations of dissolved and THCs were predicted to be highest around the release site, with concentrations exceeding the threshold for THC (100 µg/l) remaining offshore and in a much smaller areal extent than for surface oil. The highest concentrations of THC are predicted near or at surface. Concentrations dissipated as the oil was transported away from the release location with the largest portion of the oil predicted to be transported towards the east.

7.9.3.2 Batch Spills – Model Summary

The results from the modelling of unmitigated batch spills show that the potential spatial area that may be affected is much smaller than from the modelled unmitigated subsurface releases.

For the unmitigated batch spills at the FPSO location (8,300 m³ FPSO surface release and 1,000 m³ offloading), it was predicted to result in 37 to 39 percent of the released volume evaporating to the atmosphere, 29 percent remaining on the water surface, 22 to 24 percent degraded, 10 to 11 percent remaining entrained in the water column, 0.01 percent on sediments and 0 percent contacted the shore at the end of the 30 day model simulations. These batch spills resulted in cumulative maximum surface oil of >0.04 µm threshold extending approximately 200 to 300 km to the east of the release location (Figure 16-33 in the EIS). Thicker dark brown sheens (0.01 to 0.1 mm) were predicted within 100 km or less of the release location, while thinner dull brown sheens (0.001 to 0.01) were predicted to extend approximately 375 km to the southeast from the release site. The areas where concentrations of THC in the water column were predicted to exceed 500 µg/L were in the immediate vicinity of the release site for both spill scenarios. There was no shoreline oiling predicted from the batch spills; all oil remained offshore.

The unmitigated seafloor flowline release of 500 m³ of crude was predicted to result in a primarily dull brown sheen (0.001 to 0.01 mm) that extended approximately 300 km to the southwest from the release location. At the end of the 30-day simulation, 42 percent of the total release volume was predicted to evaporate, 32 percent to remain on the water surface, 20 percent degraded, while, 6 percent entrained, and no oil was predicted to be found on sediments or shorelines. The model simulation was predicted to result in in-water THC concentrations up to 100 µg/L within 250 km from the release site (Figure 16-36 of the EIS). Shoreline oiling as not predicted.

For the marine diesel batch spill, 58 percent of the total release volume was predicted to evaporate, 30 percent degraded, 12 percent entrained in the water column and less than 1 percent remained at the water surface. Surface oiling was predicted to result in a patchy and discontinuous distribution of colorless or silver sheen of oil < 0.0001 mm (0.1 µm) close the release location. The marine diesel batch spill resulted in the smallest volume of water exposed to THC concentrations exceeding 1 µg/L, where concentrations were generally less than 5 µg/L in an area within 200 km of the release site (Figure 16-38 in EIS).

7.9.3.3 SBM Spills – Model Summary

For surface loss of SBM, the maximum extent of deposition thickness of 0.1 mm was predicted to be within 1.5 km of the spill location at Site 1 and within 590 m at Site 2. The depth of each release site had the greatest potential to increase the extent of deposition but also generally reduced the predicted total thicknesses of the deposit. In the simulation results, the extent of deposition from surface releases was intensified by prevailing currents during winter conditions. Subsurface releases occurring from a BOP disconnect or flex joint failure near the seafloor would be expected to result in thicker deposition over a smaller area than from surface releases, due to the faster settling time of particles released from a wide, low velocity flow incident. For a flex joint release, the 10 mm deposition thickness was between 60 to 80 m from the release site. Deposition thickness of 10 mm for a BOP spill was within 60 to 70 m of the release location.

7.9.3.4 Vessel Collision

In the Flemish Pass Exploration Drilling Project EIS, Nexen Energy ULC (2018) modelled a 750 m³ spill from a vessel-to-vessel collision between St. John's, NL and their proposed project area in the Flemish Pass. The model results indicated that the release migrated to the east and did not result in oil contacting the shoreline. In addition, the release would be discontinuous and patchy surface sheens, with a 40-km rainbow sheen that would transition to the colorless and silver sheen. A surface oil exposure area of 13 km² and 925 km² for the 10 µm ecological threshold and 0.04 µm socio-economic threshold, respectively, was predicted (Nexen Energy ULC 2018).

Based on the results of the Nexen diesel model (Nexen Energy ULC 2018), Equinor Canada did not undertake a vessel-to-vessel spill model because the scenario and results would be similar and therefore representative.

7.9.4 Potential Environmental Effects

This section summarizes the potential environmental effects that may occur for each of the identified VCs if an accidental event occurs, such as an extremely unlikely subsurface blowout or a batch / instantaneous spill. A more detailed assessment can be found in the Section 16.7 of the EIS.

7.9.4.1 Marine Fish and Fish Habitat

In the very unlikely event of a subsurface blowout, some degree of residual adverse effects to Marine Fish and Fish Habitat in the area at the time of the accident or malfunction are expected. The degree of exposure and thus the type and level of any such effects would depend on the type and size of spill, time of year, and the number, location, and species of animals within the affected area. Although there is the potential for effects on fish and their habitats in the RSA, these are, with appropriate mitigations, not likely to result in an overall detectable decline in overall fish abundance or change in the spatial and temporal distribution of fish populations in the overall RSA for multiple generations. Similarly, while any affected individuals could conceivably be part of a SAR, it is unlikely that the overall abundance, distribution or health of any such species and its eventual recovery will be negatively affected.

Based on modelling results in the CNOOC EIS (CNOOC 2018), it is predicted the highest probability of oil reaching the Azores where shoreline exceeded the 1 gm/² was 70 and 77 percent (depending on scenario) in the summer months. The modelled 95th percentile representative deterministic shoreline scenario predicted a minimum time for oil to reach the Azores at was between 80 days and 111 days, depending on the spill site. Therefore, oil that is predicted to make shore would be highly weathered (i.e., the more toxic components of oil are the lighter more volatile ends that would have evaporated, dissolved, and degraded over time), thereby reducing the toxicity of the residual oil. It would be present as patchy and discontinuous emulsified oil and/or tarballs. With the application of mitigation and response measures, as noted above, it would further reduce potential for effects.

Modelling was carried out in the Fisheries Closure Area (FCA) within the Core BdN Development Area, a special area noted for the presence of sea pens. Model predictions indicate minimal interactions with benthic habitats; therefore, it is expected there will be limited residual adverse

effects on fish habitat and benthic species, including sensitive coral, sponge, and seapens. However, eventual break down of oil material in marine environments may become transported to benthic habitats through microbial and plankton pathways by sinking and flocculation. In the context of applied mitigations, these adverse environmental effects are considered unlikely and therefore not predicted to have a significant effect on fish habitat. Spill prevention techniques and response strategies will be incorporated into the design and operations for all Project activities as part of contingency planning, which will further help to reduce the likelihood of effects.

In the extremely unlikely event a subsurface blowout occurred, or if a smaller or batch spill occurred, occurred, spill prevention and mitigation measures would reduce the chances that there would be significant adverse environmental effects to fish populations and fish habitats in the RSA. Therefore, it is predicted that the accidental events associated with the Project will not result in significant residual adverse effects on Marine Fish and Fish Habitat.

7.9.4.2 Marine and Migratory Birds

Accidental events such as oil spills can have important, adverse consequences for marine-associated birds, leading to potential changes in the presence, abundance, distribution and/or health of marine birds (individuals and populations). Exposure to accidental oil spills from drilling or production installations or vessels may affect individuals (through physical exposure, ingestion), important habitats and food sources. Marine birds are among the biota most at risk from oil spills, as they spend much of their time upon the surface of the ocean (LGL Limited 2005; Boertmann and Mosbech 2011; Barron 2012). In the event of a spill, and depending upon project- and area-specific factors, coastal birds may also be at risk on beaches and in intertidal zones.

Based on modelling results in the CNOOC EIS (CNOOC 2018), it is predicted the highest probability of oil reaching the Azores where shoreline exceeded the 1 gm/² was 70 and 77 percent (depending on scenario) in the summer months. The modelled 95th percentile representative deterministic shoreline scenario predicted a minimum time for oil to reach the Azores at was between 80 days and 111 days, depending on the spill site. Therefore, oil that is predicted to make shore , it would be highly weathered (i.e., the more toxic components of oil are the lighter more volatile ends that would have evaporated, dissolved, and degraded over time), thereby reducing the toxicity of the residual oil. It would be present as patchy and discontinuous emulsified oil and/or tarballs. With the application of mitigation and response measures, as noted above, it would further reduce potential for effects.

In consideration of the known effects of oil spills on marine-associated birds, the result of spill modelling exercises, and with the implementation of mitigation measures, a precautionary conclusion is drawn that residual environmental effects from an extremely low probability subsurface blowout on Marine and Migratory Birds are predicted to be significant depending on the specific occurrence, the nature and degree of the event, and the presence of certain species of birds. Infrequent batch spills and SBM releases are predicted to affect a smaller number of individuals and be reversible at the population level, therefore would not cause a detectible decline in overall abundance or change in distribution over more than one generation. Therefore, it is predicted that batch spills and accidental SBM releases associated with the Project will not result in significant residual adverse effects on Marine and Migratory Birds.

In the extremely unlikely event of a subsurface blowout, some degree of residual adverse effects to marine and migratory birds present in the area at the time of the accident or malfunction are expected. The degree of exposure and thus the type and level of any such effects is highly dependent on the type and size of spill, time of year, and the number, location, and species of marine and migratory birds within the affected area. For the blowout scenarios, these environmental effects could, however, be significant if it leads to a detectable decline in overall bird abundance or change in the spatial and temporal distribution of bird populations in the overall RSA for multiple generations. Significant residual effects on Marine and Migratory Birds are considered to be extremely unlikely given the very low probability of a subsurface blowout to occur and the response mitigations that will be implemented.

7.9.4.3 Marine Mammals and Sea Turtles

Marine mammals and sea turtles may experience a change in mortality or injury (acute or immediate effects) if directly exposed to accidentally-released hydrocarbons or associated volatiles and aerosols. They may experience a change in health (sub-lethal effects) from direct contact with hydrocarbons (including volatiles and aerosols) or consumption of contaminated prey. There may be a change in habitat (marine water or shoreline / haul-out) quality and/or use due to oiling and associated response measures. The availability and quality of food (prey items) may also be adversely affected by an accidental release event.

Based on modelling results in the CNOOC EIS (CNOOC 2018), it is predicted the highest probability of oil reaching the Azores where shoreline exceeded the 1 gm/² was 70 and 77 percent (depending on scenario) in the summer months. The modelled 95th percentile representative deterministic shoreline scenario predicted a minimum time for oil to reach the Azores at was between 80 days and 111 days, depending on the spill site. Therefore, oil that is predicted to make shore, it would be highly weathered (i.e., the more toxic components of oil are the lighter more volatile ends that would have evaporated, dissolved, and degraded over time), thereby reducing the toxicity of the residual oil. It would be present as patchy and discontinuous emulsified oil and/or tarballs. With the application of mitigation and response measures, as noted above, it would further reduce potential for effects.

In consideration of the known effects of spills on Marine Mammals and Sea Turtles, the results of spill modelling exercises, and with the implementation of mitigation measures, it is predicted that accidental events associated with the Project will not result in significant residual adverse effects on Marine Mammals and Sea Turtles.

In the extremely unlikely event of a large offshore oil release, some degree of residual adverse effects to Marine Mammals and Sea Turtles are expected. The degree of exposure and thus the type and level of any such effects would depend on the type and size of spill, time of year, and the number, location and species of animals within the affected area. Although there is the potential for effects on marine mammals, sea turtles and their habitat in the RSA, these are, with appropriate mitigation, not likely to result in a detectable decline in overall abundance or change in the spatial and temporal distributions of marine mammal and sea turtle populations in the overall RSA for multiple generations. Spill prevention techniques and response strategies will be incorporated into the design and operations for all Project activities as part of contingency planning, which will further help to ensure that effects do not occur.

In the unlikely event a spill occurred, spill prevention and mitigation measures would reduce the chances that there would be significant adverse environmental effects to marine mammals and/or sea turtles in the RSA. Therefore, it is predicted that the accidental events associated with the Project will not result in significant residual adverse effects on Marine Mammals and Sea Turtles.

7.9.4.4 Special Areas

The extent of the potential effects on Special Areas will depend on how the spill trajectory and the VC overlap in both space and time. Potential effects on Special Areas, in the unlikely event of an accidental release of hydrocarbons, includes potential degradation of the ecological integrity of the special area such that it is not capable of providing the same biological or ecological function for which it is designated. The Special Areas VC is therefore closely linked to other VCs considered in this assessment, particularly the biological VCs.

Based on modelling results in the CNOOC EIS (CNOOC 2018), it is predicted the highest probability of oil reaching the Azores where shoreline exceeded the 1 gm/² was 70 and 77 percent (depending on scenario) in the summer months. The modelled 95th percentile representative deterministic shoreline scenario predicted a minimum time for oil to reach the Azores at was between 80 days and 111 days, depending on the spill site. Therefore, oil that is predicted to make shore , it would be highly weathered (i.e., the more toxic components of oil are the lighter more volatile ends that would have evaporated, dissolved, and degraded over time), thereby reducing the toxicity of the residual oil. It would be present as patchy and discontinuous emulsified oil and/or tarballs. With the application of mitigation and response measures, as noted above, it would further reduce potential for effects.

It is predicted that accidental events associated with the Project will not result in significant residual adverse effects on Special Areas. In the unlikely event of a subsurface blowout, some degree of residual adverse effects to the defining features of special areas that are within or near the zone of influence of the spill are expected. The degree of exposure and thus the type and level of any such effects would depend on the type and size of spill, time of year, the location relative to special areas (especially those that include important marine bird habitats) and other factors such as the numbers and types of species present during such an event. Residual environmental effects are predicted to be not significant as there would not be a change in key characteristics and processes for which a special area is defined and valued by society. Spill prevention techniques and response strategies will be incorporated into the design and operations for all Project activities as part of contingency planning, which will further help to reduce the likelihood of effects.

In the unlikely event a spill occurred, spill prevention and mitigation measures would reduce the chances that there would be significant adverse environmental effects to special areas in the RSA. Therefore, it is predicted that the accidental events associated with the Project will not result in significant residual adverse effects on Special Areas.

7.9.4.5 Commercial Fisheries and Other Ocean Uses

There is limited to no fishing within the Core BdN Development Area. In the unlikely occurrence of an accidental event, fisheries that could be affected would be those in the Project Area and some of those active within the RSA at the time of a spill. RSA fisheries that are not in the Project Area, that

also may be affected by accidental events, include the deep-sea clam fishery (southern 3L and 3N), small pelagic species fisheries (capelin and herring – nearshore and coastal bays), lobster (nearshore) and sealing. There are also aquaculture sites within coastal areas of the RSA, the closest currently more than 400 km away from the Project Area. Recreational groundfish fisheries occur at designated times during the summer and fall, typically in nearshore areas and bays within the RSA.

In the case of an accidental event such as a subsurface blowout or batch spill, the effects from any actual event would depend on the interaction of several factors, such as the location of the release, the duration of the release, the quantity and type of hydrocarbons released, the time of year, the timing and location of fisheries and other marine activities, and the prevailing environmental conditions at the time. These factors together would determine the magnitude and extent of any effects on fisheries.

Equinor Canada will develop and implement a compensation program for damages resulting from Project activities, including accidental events. This plan will outline compensation procedures for actual loss or damages to commercial fisheries, including commercial-communal fishers, attributable to the operator. Requirements from the C-NLOPB include the ability of an operator to demonstrate the financial resources to meet a liability obligation of $1 billion relating to damages, and to pay a deposit of $100 million for financial responsibility if an accidental event occurred. Equinor Canada will also provide timely issuance of Notices to Shipping if an accidental event that has occurred including the associated coordinates and undertake early and ongoing communication with commercial fishers and other industry stakeholders within the RSA Harvesting areas where the socio-economic threshold is exceeded may be closed by DFO or international bodies, thereby reducing potential for gear damage and potentially tainted product from entering the marketplace.

Based on modelling results in the CNOOC EIS (CNOOC 2018), it is predicted the highest probability of oil reaching the Azores where shoreline exceeded the 1 gm/² was 70 and 77 percent (depending on scenario) in the summer months. The modelled 95th percentile representative deterministic shoreline scenario predicted a minimum time for oil to reach the Azores at was between 80 days and 111 days, depending on the spill site. Therefore, oil that is predicted to make shore it would be highly weathered (i.e., the more toxic components of oil are the lighter more volatile ends that would have evaporated, dissolved, and degraded over time), thereby reducing the toxicity of the residual oil. It would be present as patchy and discontinuous emulsified oil and/or tarballs. Surface oiling is predicted to occur to the areas to the east of BdN model domain at thicknesses >0.04 µm in areas beyond NAFO division 3LMN and in the surface waters surrounding the Azores. While the model predicts surface oiling above the socio-economic threshold (0.04 µm), mitigations as noted above would reduce the overall effects to commercial fisheries.

In consideration of the present knowledge of commercial fishery and other marine in the RSA, the result of spill modelling exercises, and planned spill response and mitigation measures, it is predicted that accidental events associated with Project will not result in significant residual adverse effects on Commercial Fisheries and Other Ocean Uses. Not only is subsurface blowout extremely unlikely, but its extent and duration will be reduced through response measures and affected fishers will be compensated in consideration of the C-NLOPB Compensation Guidelines Respecting Damages relating to Offshore Petroleum Activities, including compensation for lost and future lost income from an accidental event. Spill prevention techniques and response strategies will be incorporated into

the design and operations for all Project activities as part of contingency planning, which will further help to reduce the likelihood of effects. In the unlikely event effects occurred, these measures would reduce the chances that there would be significant adverse effects on commercial fisheries activities or other ocean users. Therefore, it is predicted that the accidental events associated with the Project will not result in significant residual adverse effects on Commercial Fisheries and Other Ocean Uses.

7.9.4.6 Indigenous Peoples

In consideration of the location of Indigenous communities and the activities undertaken by Indigenous groups within the RSA, the results of spill modelling exercises and planned mitigation measures, is predicted that the accidental events associated with the Project will not result in significant residual adverse effects on Indigenous Peoples.

No Indigenous communities, or activities associated with the current use of lands and resources for traditional purposes are undertaken, within or near the Project Area itself. Indigenous communities range approximately 640 km to 2,000 km from the Project Area. The oil spill modelling completed for this EIS indicates that there is very limited potential for oil to reach the shoreline near any Indigenous community, making Project-related restrictions upon access to traditional harvesting areas extremely unlikely. Potential impacts upon commercial-communal fisheries in the LSA would be reduced by the application of prevention and response measures.

The potential for effects upon Indigenous Peoples would therefore be primarily indirect in nature and related to the possibility that marine-associated species harvested by Indigenous fishers in either the commercial-communal or traditional fishery could be affected by a spill. The degree of exposure and occurrence of effects upon marine-associated species would depend on the type and size of spill, time of year, location, and the types of marine species present within the affected area. There is limited potential for an accidental event to have an adverse effect on the presence, abundance, distribution or quality of marine species, and on the overall availability or sufficiency of the species for resource use activities, including the current use of lands and resources for traditional purposes.

As described in the EIS, for each of the modelled releases, oil on the surface was most likely to move to the east due to the prevailing westerly winds and surface currents within the region. Based on deterministic modelling, there is no potential for any spill to reach and adversely affect any of the Indigenous communities listed in the EIS Guidelines. As there are no sites, structures or things of historical, archaeological, paleontological, or architectural significance in the LSA and no potential for oil to reach the traditional territories of any of the listed Indigenous groups, no direct effects on sites, structures, or things of historical, archaeological, paleontological, or architectural significance are predicted.

Based on modelling results in the CNOOC EIS (CNOOC 2018), it is predicted the highest probability of oil reaching the Azores where shoreline exceeded the 1 g/m² was 70 and 77 percent (depending on scenario) in the summer months. The modelled 95th percentile representative deterministic shoreline scenario predicted a minimum time for oil to reach the Azores at was between 80 days and 111 days, depending on the spill site. Therefore, oil that is predicted to make shore it would be highly weathered (i.e., the more toxic components of oil are the lighter more volatile ends that would have evaporated, dissolved, and degraded over time), thereby reducing the toxicity of the residual oil. It

would be present as patchy and discontinuous emulsified oil and/or tarballs. With the application of mitigation and response measures, as noted above, it would further reduce potential for effects.

In terms of potential indirect effects due to associated biophysical changes resulting from such a spill, while it is not possible to determine with certainty whether a migratory individual of any species used for traditional purposes by any group may be present in the affected area before moving to an area that is the subject of traditional harvesting activity, as illustrated in Chapters 9 and14 of the EIS, there is limited potential for any degree of interaction. The probability of a subsurface blowout occurring is extremely low, and in the event of a spill, the species (individual fish, bird or marine mammal) would have to be present in the area at that time to be potentially affected. There is therefore little potential for any effects on marine-associated species in general (and individuals in particular) to translate into a detectable effect on the use of such species for traditional purposes by an Indigenous group in eastern Canada.

Consequently, there will be little potential for biophysical effects (should they occur) upon marine species resulting from a spill to translate into a detectable decrease in the overall nature, intensity, distribution (location and timing) and quality of either the commercial-communal fishery or the current use of lands and resources for traditional purposes, including any associated health, socio-economic or cultural conditions. Spill prevention techniques and mitigation measures, including development of a fisheries compensation program, will be incorporated into the design and operations for all Project activities as part of contingency planning, which will further reduce the potential for any effects to occur. Therefore, it is predicted that the accidental events associated with the Project will not result in significant residual adverse effects on Indigenous Peoples.

7.10 Effects of the Environment on the Project

The physical environmental setting of an area is an important consideration in the planning, review and conduct of offshore oil and gas production activities. Understanding and carefully considering the environment, including winds, waves, currents, ice, precipitation, and other factors, such as seismicity, enables Project design and operation to occur in a manner that protects human health and safety, the environment, and equipment and infrastructure. This includes avoiding or reducing the potential for incidents and accidents. The key environmental factors that could affect this Project include:

- Seismicity and geohazards
- Climatology, weather and oceanographic conditions
- Sea ice and icebergs
- Climate change

Each of these are discussed in more detail in the EIS.

7.10.1 Assessing and Mitigating Potential Effects of the Environment on the Project

Environmental conditions (including extreme events) play a key role in the design, planning and operations of offshore oil and gas production activities. This includes consideration of, and planning for, typical environmental conditions within the offshore area in question, as well as consideration of

potential extreme events. Specific mitigation measures to prevent or reduce adverse effects are listed below:

- Design of the FPSO such that it can operate in deep water and in the environmental conditions prevalent in the Project Area and larger RSA
- Selection criteria for drilling installation, OSVs and other vessels engaged in Project activities such that they can operate year-round at water depths and the environmental conditions prevalent in the Project Area and larger RSA
- The Project will comply with Canadian regulations for engineering design and will adhere to international standards where applicable
- Third-party certification, a Certificate of Fitness, for the FPSO, the drilling installation and subsea infrastructure, as required to obtain an OA issued by the C-NLOPB
- Wells will be positioned to avoid geohazards; location, design, and/or operational plan will be adjusted to reduce the risk to an acceptable level
- Physical environment data observations, weather forecasting, and reporting will be conducted in consideration with the Offshore Physical Environmental Guidelines (NEB et al. 2008)
- Radio communication systems will be in place to contact other marine vessels, shorebase and OSVs
- Ability to quick disconnect the FPSO and/or drilling installation in event of an emergency.
- The FPSO will be designed in accordance with recognized standards to handle certain extreme icing loads, including the buildup of ice, should it occur
- With regards to superstructure icing, which can occur under certain meteorological conditions, the installations will be monitored for icing conditions and accumulation rates, as applicable. Measures to reduce icing include removal and/or melting of the ice
- Implementation of 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
- Weather forecasting services to provide site specific forecasting for production and drilling operations
- The FPSO, drilling installation and offshore vessels will have obstruction lights, navigation lights, and/or foghorns
- Vessel captains, helicopter pilots and the Offshore Installation Managers of the FPSO or drilling installation are responsible and have the authority to suspend or modify respective operations in case of adverse weather or environmental conditions that could compromise the environmental integrity of operations

7.10.2 Residual Effects Summary

A significant adverse residual effect of the environment on the Project is defined as one that results in one or more of the following:

- Project infrastructure is damaged, causing harm to Project personnel or the public
- A substantial impact to the Project schedule delaying Project activities by more than one season or resulting in a shutdown of production or drilling operations for three months or more
- Project infrastructure is damaged, resulting in repairs that are not technically or economically feasible

Given the life of field for the Project, the probability of a major seismic event (and resulting landslides or tsunamis) occurring during the life of the Project is very low. The Certificate of Fitness for the FPSO and drilling installation(s) also requires that the installation be designed with potential environmental loads imposed by earthquakes and other naturally occurring phenomena taken into account. Wells will also be positioned to avoid geohazards; location, design, and/or operational plan will be adjusted to reduce the risk to an acceptable level.

Adverse weather and oceanographic conditions, such as high winds, large waves, low visibility or freezing precipitation may affect Project activities. They can hinder helicopter and supply vessel transits. Extreme wind and wave conditions could also result in accidental spills, suspension or delay of operations (production and/or drilling), evacuation of the installations, and in extreme cases, may lead to fatalities. Mitigation measures to address these potential effects are outlined above.

Presence of sea ice and icebergs can hinder support vessel navigation and delivery of personnel and supplies. Their presence in the area may also result in the need to suspend operations or move the FPSO and/or drilling installation to avoid collision. Icebergs can pose a risk to subsea equipment; however, with water depths in the Project Area, there is no risk of iceberg scour. Equinor Canada's Project-specific ice management plan will include procedures related to ice detection, monitoring and assessment as well as the physical management of icebergs, and will outline procedures for the implementation of disconnection and movement of the FPSO due to presence of an iceberg.

Based on the significance criteria defined above, and with the application of the engineering and environmental design standards, operational procedures, offshore regulations (e.g., *Newfoundland Offshore Certificate of Fitness Regulations, Newfoundland Offshore Petroleum Installations Regulations*), flag state regulations, international codes, and Classification Society Rules, and adherence to the Offshore Physical Environmental Guidelines (NEB et al. 2008), it is predicted that there will be no significant adverse residual effects of the environment on the Project.

8.0 SUMMARY OF RESIDUAL EFFECTS, MITITGATION AND COMMITMENTS

A summary of the residual adverse effects for each VC from Project-related interactions, accidental events, and cumulative effects is provided in Table 8.1.

Table 8.1 Summary of Residual Environmental Effects for Routine Operations, Accidental Events, and Cumulative Effects

VC	Routine Operations	Accidental Effects		Cumulative Effects
	Significance of Residual Environmental Effect	Significance of Residual Environmental Effect	Likelihood of Significant Effect	Significance of Residual Environmental Effect
Marine Fish and Fish Habitat (including SAR)	N	N	N/A	N
Marine and Migratory Birds (including SAR)	N	S	Extremely unlikely	N
Marine Mammals and Sea Turtles	N	N	N/A	N
Special Areas (including SAR)	N	N	N/A	N
Commercial Fisheries and Other Ocean Uses	N	N	N/A	N
Indigenous Peoples	N	N	N/A	N

Key:
N = No significant residual adverse environmental effect
S = Significant residual adverse environmental effect
L = Low likelihood
N/A = Not Applicable

In conclusion, with the application of mitigation measures (Sections 7.1.1, 7.2.4, 7.3.4, 7.4.4, 7.5.4, 7.6.4, and 7.7.4 and EIS Section 18.2), the routine operations of the Project are not predicted to result in significant adverse residual environmental effects on the environment and will not cumulatively interact with other offshore activities in the Canada-NL Offshore Area, in a way that would cause significant environmental effects.

Under certain circumstances, a precautionary conclusion is drawn that residual environmental effects from an extremely low probability of accidental subsurface blowout on Marine and Migratory Birds can be significant. However, with the implementation of spill prevention measures, significant residual adverse effects are extremely unlikely to occur.

9.0 FOLLOW-UP AND MONITORING

Under CEAA 2012, a follow-up program is defined as a program for "verifying the accuracy of the environmental assessment of a designated project" and "determining the effectiveness of any mitigation measures." It is commonly referred to as environmental effects monitoring (EEM). Based on the information presented in the EIS, and the conclusion of the effects assessment, a summary of proposed follow-up, compliance monitoring and observational programs is provided in Table 9.1.

The follow-up monitoring program will be developed in consultation with the C-NLOPB and relevant government departments (e.g., DFO, ECCC). Indigenous groups and key stakeholders will be engaged, as appropriate. The design of EEM will take into consideration the results of other offshore EEM programs (both previous and ongoing) and use technology specifically suited to the monitoring of a production project at 1,200 m water depths and use Equinor's global experience in EEM and ongoing research and new technologies.

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

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

Components of follow-up monitoring included in other offshore production operations include sediment and water sampling, fish taint, benthic community analysis. These components may be included in the follow-up monitoring program for the BdN Development Project. In keeping with adaptive management, the effects monitoring program will be designed such that monitoring parameters can be modified or discontinued over time, for instance if the zone of influence of a certain discharge is verified or if no effects are detected.

The EEM program design must be reviewed and accepted by the C-NLOPB in order to obtain an OA.

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

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

Table 9.1 Summary of Environmental Monitoring Programs for Routine Project Activities

Proposed Monitoring Program	Program Overview	Applicable VC(s)	Proposed Intervention / Adaptive Management	Reporting
Marine EEM Program	• Program to determine effectiveness of mitigation measures. Options for this program will consider technology-based verses person-based sampling efforts • Program to confirm modelling predictions for zones of influence	Marine Fish and Fish Habitat (including SAR) Marine Mammals and Sea Turtles (including SAR)	Survey is for data gathering purposes and determining the effectiveness of mitigation measures and confirming EIS predictions For marine mammals, purpose is to confirm underwater sound transmissions predicted by modelling	• Reporting requirements will be determined in consultation with C-NLOPB
Seabird Observations	• Options for seabird observations are under development and may be technology-based or observer based. • Regular searches of vessel decks (FPSO, drilling installation, SBVs) will be undertaken and accepted protocols for the collection / handling of bird mortalities and release of birds that become stranded	Migratory and Marine Birds (including SAR)	Survey is for data gathering purposes.	• Reporting requirements for the observational program will be determined in consultation with ECCC. • If a SAR is found, a report will be sent to ECCC for identification. • In accordance with the Seabird Handling permit, an annual report and all occurrence data summarizing stranded and/or seabird handling will be submitted to ECCC.

Table 9.1 Summary of Environmental Monitoring Programs for Routine Project Activities

Proposed Monitoring Program	Program Overview	Applicable VC(s)	Proposed Intervention / Adaptive Management	Reporting
Marine Mammal and Sea Turtle Observations	• Operational program for marine mammals during 4D seismic surveys may include the following elements. Specific details of the plan will be determined in consultation with DFO. • A trained marine mammal observer will be onboard to record marine mammal and sea turtle sightings during 4D seismic survey operations • A marine mammal and sea turtle monitoring plan will be submitted to the applicable regulators for review in advance of the commencement of the first geophysical survey • Visual monitoring for the presence of marine mammals and sea turtles within a pre-determined exclusion zone • Observational / shutdown procedures will follow the SOCP and will include baleen whales	Marine Mammals and Sea Turtles (including SAR)	Survey is for data gathering purposes and reducing potential interactions	• Reporting requirements for the observational program will be determined in consultation with C-NLOPB and DFO. • Vessel strikes involving marine mammals or sea turtles will be reported to DFO.
Environmental Compliance Monitoring	• Environmental compliance monitoring is a requirement of the *Drilling and Production Regulations*. Monitoring and reporting of discharges identified in the EPP will be undertaken. It may include, but not limited to: - Produced water - Deck drainage - Drill cuttings	All		• In accordance with the OWTG, monthly compliance monitoring reports will be submitted to C-NLOPB • Other reporting requirements will be determined in consultation with C-NLOPB

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