



EQUINOR CANADA LTD.

BAY DU NORD DEVELOPMENT PROJECT

Project Description Summary

June 2018

Table of Contents

	List of Acronyms and Abbreviations	iv
1	Introduction	1
1.1	Project Background and Objectives	1
1.2	Proponent Information	3
1.3	Regulatory Framework	5
1.3.1	Canadian Environmental Assessment Act	5
1.3.2	The Accord Acts	5
1.3.3	Federal Funding	6
1.3.4	Other Regulatory Requirements and Interests	6
2	Project Description	8
2.1	Project Area	8
2.2	Project Overview	9
2.2.1	Project Components and Activities	13
2.2.1.1	Development Drilling	14
2.2.1.2	Subsea infrastructure	15
2.2.1.3	Production Installation	16
2.2.1.4	Offshore Construction, Installation and Hook-up and Commissioning	17
2.2.1.5	Production and Maintenance Operations	18
2.2.1.6	Other Supporting Activities	19
2.2.1.7	Supply and Servicing	21
2.2.1.8	Decommissioning	22
2.2.1.8.1	Well Decommissioning	23
2.2.2	Potential Future Development	23
2.3	Project Schedule	23
2.4	Discharges, Emissions and Waste and their Management	25
2.4.1	Atmospheric Emissions	25
2.4.2	Sound and Light Emissions	26
2.4.2.1	Underwater Sound	26
2.4.3	Drilling Wastes	26
2.4.4	Liquid Discharges	27
2.4.5	Hazardous and Non-Hazardous Solid Wastes	28
2.5	Potential Accidental Events	28
3	Environmental Setting	30
3.1	Previous Studies and Available Information: Eastern Newfoundland Offshore Area	30
3.2	Physical Environment	31
3.3	Biological Environment	31
3.4	Human Environment	36



3.4.1	Commercial Fisheries	36
3.4.2	Indigenous Commercial-Communal Fisheries	36
3.4.3	Other Ocean Uses	40
4	Engagement	42
4.1	Regulatory Engagement	42
4.2	Indigenous Engagement	43
4.2.1	Background	43
4.2.2	Approach to Engagement	47
4.2.3	EIS Preparation	47
4.2.4	Post-EIS Submission	48
4.2.5	Issues and Concerns	48
4.3	Stakeholder Engagement	49
5	Potential Project-Related Environmental Interactions	50
5.1.1	Planned Project Components and Activities	50
5.1.2	Potential Unplanned Events	52
5.2	Environmental Assessment Scoping Considerations	55
6	References	56

List of Figures

Figure 1.1	Proposed Project Location	2
Figure 1.2	Equinor Capital Value Process	3
Figure 2.1	Project Area	10
Figure 2.2	Illustration of a Typical Subsea Development	11
Figure 2.3	Illustration of Potential Layout of Core BdN Development	12
Figure 2.4	Schematic of a Drillship (left) and Semi-Submersible (right)	14
Figure 2.5	Typical FPSO - Husky Energy White Rose FPSO	16
Figure 2.6	Preliminary Project Schedule	25
Figure 3.1	Identified Special Areas in Proximity to the Project Area (Canadian Designations)	34
Figure 3.2	Identified Special Areas in Proximity to the Project Area (International Designations)	35
Figure 3.3	Commercial Fishing Locations, All Species (2010-2016)	38
Figure 3.4	NAFO Fishing Zones and Foreign Fleet Fisheries "Footprint"	39
Figure 3.5	Previously Drilled Oil and Gas Wells (not inclusive of all wells drilled)	41
Figure 4.1	Indigenous Communities in Newfoundland and Labrador	45
Figure 4.2	Indigenous Communities in the Maritime Provinces and Quebec	46

List of Tables

Table 2.1	Proposed Project Area Coordinates.....	8
Table 2.2	Proposed Core BdN Development Project Area Coordinates.....	9
Table 2.3	Preliminary Location – Production Installation	9
Table 2.4	Overview of Core BdN Development and Potential Future Development Activities.....	13
Table 2.5	Anticipated Timing of Project Activities	24
Table 3.1	Commercial-Communal Fishing Licenses Issued to Newfoundland and Labrador Indigenous Groups off Eastern Newfoundland	36
Table 4.1	Indigenous Groups Engaged by Equinor Canada to Date	43
Table 5.1	Environmental Components / Issues and Potential Environmental Interactions Relevant to CEAA 2012 – Planned Project Components and Activities	50
Table 5.2	Environmental Components / Issues and Potential Environmental Interactions Relevant to CEAA 2012 – Unplanned Project Components and Activities	53

List of Acronyms and Abbreviations

2D	Two dimensional
3D	Three dimensional
4D	Four dimensional
API	American Petroleum Institute
AUV	Autonomous Underwater Vehicle
BdN	Bay du Nord
BOP	Blowout Preventer
BOPD	Barrels of Oil Per Day
CEAA 2012	Canadian Environmental Assessment Act 2012
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
CO	Carbon monoxide
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CVP	Capital Value Process
DFO	Fisheries and Oceans Canada
DG	Decision Gate
EA	Environmental Assessment
EBSA	Ecologically and Biologically Significant Areas
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
EL	Exploration License
FEED	Front End Engineering and Design
FFAW-Unifor	Fish, Food and Allied Workers - Unifor
FSC	Food, social and ceremonial
GHG	Greenhouse Gases
HP	High Pressure
IMO	International Maritime Organization
LP	Low pressure
MARPOL	International Convention for the Prevention of Pollution from Ships
MODU	Mobile Operating Drilling Unit
NAFO	North Atlantic Fisheries Organization
NEB	National Energy Board
NL	Newfoundland and Labrador
OA	Operation Authorization
OCSG	Offshore Chemical Selection Guidelines
OWTG	Offshore Waste Treatment Guidelines
PL	Production License
ROV	Remotely Operated Vehicles

SARA	Species at Risk Act
SBM	Synthetic Based Mud
SDL	Significant Discovery License
SEA	Strategic Environmental Assessment
Sm ³ /d	Standard cubic meters per day
UXO	Unexploded Ordance
VME	Vulnerable Marine Ecosystem
VSP	Vertical Seismic Profiling
WBM	Water-Based Mud

1 Introduction

Equinor Canada Ltd. (formerly Statoil Canada Ltd) and its partner Husky Oil Operations Limited (Husky Energy) are proposing to develop the Bay du Nord (BdN) field (which includes Bay du Nord, Bay de Verde and Bay de Verde East) and the Baccalieu discovery (collectively the Core BdN Development) offshore eastern Newfoundland for the production of oil and gas (Figure 1.1). The Core BdN Development includes offshore construction, installation, hook-up and commissioning, drilling, production operations, maintenance and decommissioning activities, as well as supporting surveys, field work, supply and servicing activities. There are no land-based activities associated with this Project. In addition to the Core BdN Development, the Project may also include potential future development activities. Hence, the Project includes the Core BdN Development and potential future development.

This Project Description Summary has been planned and developed in accordance with the *Canadian Environmental Assessment Act 2012* (CEAA 2012) and associated guidance. It also addresses the environmental assessment (EA) requirements of the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) and is intended to initiate the EA review process under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* (together, the Accord Acts).

1.1 Project Background and Objectives

The global Equinor organization (Equinor) decision process for investment projects is called the Capital Value Process (CVP) (Figure 1.2). The CVP is a structured approach to developing a project from the first assessment of a new business opportunity to the start-up of an operation. As the project matures, it goes through a series of decision gates (DG). The Core BdN Development is currently heading towards DG1. At DG1 it will move from the business planning stage to concept planning. The concept planning stage is intended to establish a clear basis for the investment project, select a preferred commercial and technical development concept and mature the business case to the required level for DG2. DG2 is the main DG before significant external resources become involved, and is the approval to take a project into the definition phase. In the definition phase, the project is matured to the required level, including front-end engineering and design (FEED) for a final investment decision to be made. DG3 represents corporate sanction of a project. Upon sanction, a project enters the execution phase, where detailed engineering, design, fabrication, installation and commissioning occurs. DG4 occurs once the facilities are ready to commence operations.

Per Equinor's CVP process, the Project has not received formal approval to proceed and is in the business planning phase. For the purposes of EA, the information presented in the Project Description assumes the Project is proceeding, even though no final decision has been made.

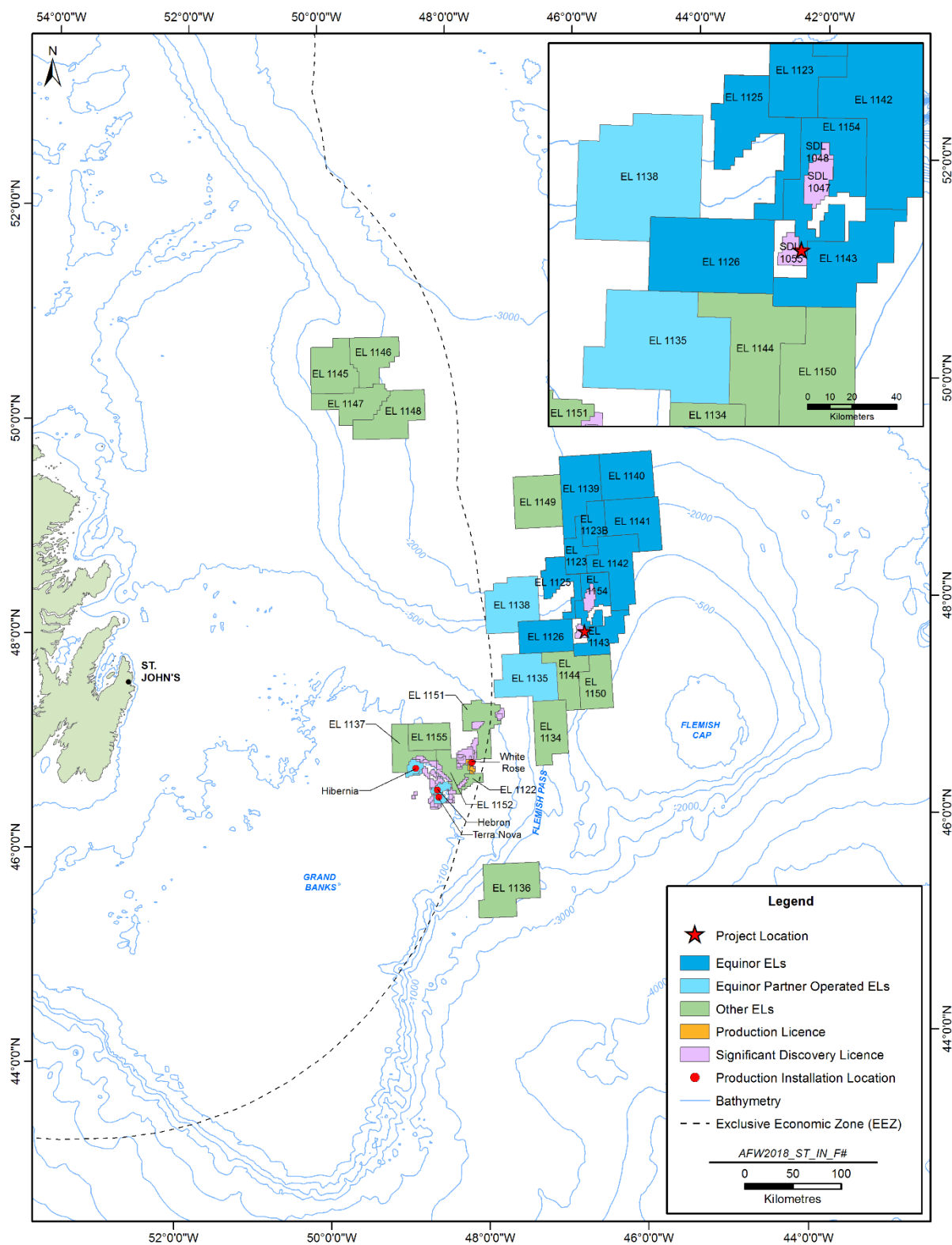


Figure 1.1 Proposed Project Location

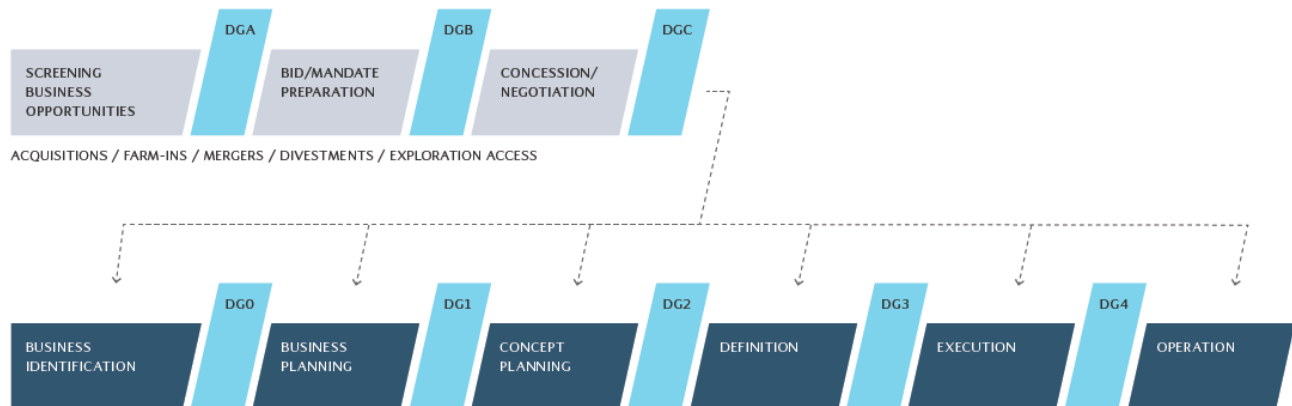


Figure 1.2 Equinor Capital Value Process

As part of the CVP, Equinor also evaluates the timing and certainty of the regulatory process and permitting requirements for the Project. The ability to execute the Project in accordance with certainty in timeline is a critical component of that evaluation.

If approved the Project will be the fifth oil and gas development offshore Newfoundland and Labrador and will be a major contributor to the provincial and national economies. It will provide important and substantial socioeconomic benefits and business opportunities for the provision of required goods and services across its various phases, as well as research and development and training opportunities. Throughout its operational phase, the Project will also contribute to overall energy diversity and supply and contribute substantial revenues to the provincial and federal governments through taxes and royalty payments.

The Project could further extend the life of the offshore oil and gas industry in Newfoundland and Labrador. Opening up the Flemish Basin for development represents an important next step in the development of a strong and sustainable offshore oil and gas industry in the province.

1.2 Proponent Information

Equinor, formerly Statoil, is Norwegian-based energy company with operations in more than 30 countries. Since 1972 Equinor has explored, developed and produced oil and gas on the Norwegian continental shelf, where it is a leading operator. From the early 1990s, Equinor has built a global business with strongholds in Europe, Africa, North America and Brazil. Equinor strives to be an industry leader on safety and to deliver high value with a low carbon footprint. Equinor employs over 20,000 individuals worldwide and 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 is the operator of 42 assets in the North Sea, the Norwegian Sea and the Barents Sea with over 50 years of oil and gas exploration and production experience. Internationally, Equinor is the operator of assets in Brazil, the United Kingdom and the United States, and has interests in countries such as Algeria, Tanzania, Angola, and Russia. Equinor ASA is 67 percent

owned by the Norwegian State and is listed on the Oslo and New York Stock Exchanges. It is headquartered in Stavanger, Norway.

In 1996, Equinor Canada Ltd. (Equinor Canada) established a Canadian headquarters in Calgary, Alberta, and a local office in St. John's, Newfoundland. Equinor Canada currently holds interest rights in the Canada-NL Offshore Area. As of April 2018, Equinor Canada is the operator of nine Exploration Licences (ELs) and five Significant Discovery Licences (SDLs), and is an interest holder on two ELs, 30 SDLs, and seven Production Licences (PLs) including Terra Nova, Hibernia, Hibernia South Extension, and Hebron production operations.

Equinor Canada holds a 65 percent interest in the Core BdN Development, and its partner, Husky Energy, holds a 35 percent interest. Equinor Canada is the Operator for the Project, and its offshore Newfoundland operations will be managed from its St. John's NL office.

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 CO₂ footprint
- Creating local opportunities
- Respecting human rights
- Being open and transparent

All communications concerning this Project and its EA review should be referred to the following:

Primary Contact for EA Purposes:

Stephanie Curran - Regulatory Lead
Equinor Canada Ltd.
2 Steers Cove, Level 2, St. John's, NL, A1C 6J5
Tel (709) 726-9091
Fax (709) 726-9053
Email: scurr@equinor.com

Primary Contacts for Bay du Nord Development and Offshore Newfoundland Operations

Einar Erjford – BdN Project Director
Unni Fjaer - Vice-President, Offshore Newfoundland
Equinor Canada Ltd.
2 Steers Cove, Level 2, St. John's, NL, A1C 6J5
Tel (709) 726-9091

1.3 Regulatory Framework

1.3.1 Canadian Environmental Assessment Act

Proposed oil and gas development activities in the Canada-NL Offshore Area are subject to EA review pursuant to the requirements of CEAA 2012 and its associated Regulations. The federal EA process under CEAA 2012 focuses on potential adverse environmental effects that are within areas of federal jurisdiction, including: fish and fish habitat, migratory birds, federal lands, and other changes to the environment that are directly linked to or incidental to federal decisions about a project.

The Regulations Designating Physical Activities (the Regulations) enacted under CEAA 2012 identify the physical activities that constitute the "designated projects" that may require a federal EA. Section 11 of the Regulations specify that offshore oil and gas development activities are subject to federal EA review:

The construction, installation and operation of a new offshore floating or fixed platform, vessel or artificial island used for the production of oil or gas.

The Project, therefore constitutes a "designated project" under CEAA 2012 and requires the submission of a Project Description (and associated Summary) to commence the EA process. For clarity, there are no additional activities proposed that are classified as a "designated project" under *the Regulations* that may require a federal EA. These documents will be reviewed by the Canadian Environmental Assessment Agency and other relevant departments, agencies, organizations, Indigenous groups and the public to help inform a governmental decision regarding whether a federal EA review of the Project is required, and if so, the nature of that review.

It is Equinor Canada's understanding that the Project will not take place on lands that have been subject to a regional study as described in Sections 73 to 77 of CEAA 2012.

1.3.2 The Accord Acts

Oil and gas activities offshore NL are regulated by the C-NLOPB, a joint federal-provincial agency that is responsible, on behalf of the Governments of Canada and NL, for petroleum resource management in the Canada–NL Offshore Area. The Accord Acts, administered by the C-NLOPB, govern all offshore oil and gas activities in the region.

As stated on the C-NLOPB's website, their role, under the Accord Acts, is to regulate oil and gas exploration and development in the Canada-NL Offshore Area, overseeing compliance with regulatory requirements for worker safety, environmental protection and safety, conservation of the resource, land tenure, and Canada / NL benefits. These processes are administered under various legislation, regulations, guidelines and memoranda of understanding.

The C-NLOPB administers a scheduled land tenure system for the issuance and administration of petroleum exploration and production rights in the Canada-NL Offshore Area.

The C-NLOPB's regulatory responsibilities include issuing licences, authorizations and approvals pertaining to offshore oil and gas exploration and development activities in the Canada-NL Offshore Area. All petroleum-related work or activity in the Canada-NL Offshore Area requires an Operating Licence and an Operations Authorization (OA) issued by the C-NLOPB. The following information must be submitted by an Operator and approved by the C-NLOPB in order to obtain an OA: EA safety plan, environmental protection plan, certificate of fitness for the proposed installation, Canada-NL benefits plan.

Other required C-NLOPB approvals may also include the approval of plans, procedures or other documents as specified by the relevant legislation or regulations. Additional oversight for environmental protection and safety of operations is provided by guidelines issued by the C-NLOPB, and jointly with the Canada-Nova Scotia Offshore Petroleum Board and/or National Energy Board (NEB) and through regulations enacted under the various legislation governing offshore petroleum activities.

The Accord Acts establish the requirements that proponents of offshore petroleum development projects must fulfil in order to obtain approval for a Development Plan. The following reports are required as part of the Development Application:

- Development Plan
- Development Plan Summary
- Benefits Plan
- Environmental Impact Statement (EIS)
- Safety Analysis and Commitment
- Socio-economic Impact Statement and Sustainability Report.

The EIS, if required for the Project under CEAA 2012, will address the EIS requirements of the C-NLOPB Development Application and/or OA processes.

1.3.3 Federal Funding

No federal funding has been requested nor provided to the proponent from any federal authority to support the Project.

1.3.4 Other Regulatory Requirements and Interests

Depending on the nature and location of a proposed offshore oil and gas project, federal and provincial departments and agencies may have regulatory responsibilities and/or provide information pursuant to their relevant legislation and mandates. Various permits, authorizations or approvals for the activities or works associated with this Project may be required, and may include:

- *Fisheries Act* Authorization: Department of Fisheries and Oceans
- Ocean Disposal Permit: Environment and Climate Change Canada
- Radio Licence: Industry Canada

- Seabird Handling and Salvage Permit: Canadian Wildlife Service, Environment and Climate Change Canada
- Species at Risk Permit: Environment and Climate Change Canada

In addition, there will be a number of licenses and certificates issued by Transport Canada or the Classification Society related to safety, security and pollution prevention. These certificates typically state how the vessel is equipped and what limitations there are, as opposed to a permit or an authorization for an activity.

Other federal legislations, and associated regulations, which may be applicable to the environmental aspects of the Core BdN Development include:

- *Oceans Act* (S.C. 1996, c. 31)
- *Fisheries Act* (R.S.C., 1985, c. F-14)
- *Canadian Environmental Protection Act* (S.C. 1999, c. 33)
- *Navigation Protection Act* (R.S.C., 1985, c. N-22)
- *Species at Risk Act* (S.C. 2002, c. 29)
- *Migratory Birds Convention Act* (S.C. 1994, c. 22)
- *Canada Shipping Act* (S.C. 2001, c. 26)

Given the nature, scope and location of the Project, it is not anticipated that provincial EA review and approval under the NL *Environmental Protection Act* will be required. It is not expected that provincial or municipal permits or authorizations will be required or that associated land use plans or land zoning will be applicable.

2 Project Description

2.1 Project Area

The Project is located in the Flemish Pass area of the Canada-NL Offshore Area, approximately 450 km east-northeast of St. John's (Figure 2.1). Water depths in the Core BdN Development Area range from approximately 1,000 m -1,200 m, whereas water depth in the broader Project Area range from approximately 340 m to 1,200 m. The Project Area includes all or portions of ELs 1125, 1126, 1143 and 1154, and SDLs 1047, 1048 and 1055 and any SDLs that may be awarded within the foregoing ELs. The Core BdN Development will occur primarily on the area as currently defined by SDL 1055 and EL1143, within the Project Area. Equinor Canada recognizes that production activities are contingent on the requisite approvals and rights issuance granted by the C-NLOPB and/or governments (refer to Section 1.3.3).

Figure 2.1 illustrates a proposed Project Area, which is approximately 4,900 km² in size. The Core BdN Development area is approximately 450 km². It is important to note that the footprint of the Project facilities on the seabed will, based on current stage of design, only cover approximately 7 km². Project area coordinates are provided in Table 2.1 and coordinates for the Core BdN Development Area are provided in Table 2.2. Preliminary project coordinates, using a proposed location of the production installation, are provided in Table 2.3. Note, final Project design is ongoing and these coordinates may change, but in the event it does, it will more than likely remain within the Core BdN Development Area and certainly within the broader Project Area described above.

Table 2.1 Proposed Project Area Coordinates

Corner Point	Coordinates – NAD 83 UTM ZONE 22N			
	Longitude (DMS)	Latitude (DMS)	Easting (m)	Northing (m)
A	46° 7' 2.400" W	48° 22' 42.619" N	417264	5358974
B	45° 56' 36.952" W	47° 58' 31.332" N	429579	5313994
C	46° 2' 55.932" W	47° 49' 59.642" N	421508	5298298
D	46° 2' 55.939" W	47° 43' 59.659" N	421357	5287184
E	47° 17' 48.813" W	47° 43' 55.569" N	327781	5289080
F	47° 17' 55.939" W	48° 4' 59.660" N	328795	5328108
G	46° 40' 25.909" W	48° 4' 59.682" N	375340	5326908
H	46° 15' 14.590" W	48° 24' 56.232" N	407208	5363256

Table 2.2 Proposed Core BdN Development Project Area Coordinates

Corner Point	Coordinates – NAD 83 UTM ZONE 23N			
	Longitude (DMS)	Latitude (DMS)	Easting (m)	Northing (m)
I	46° 7' 29.876" W	48° 1' 56.021" N	416135	5320494
J	46° 7' 38.691" W	47° 53' 36.363" N	415727	5305071
K	46° 31' 28.198" W	47° 53' 45.195" N	386052	5305854
L	46° 31' 23.225" W	48° 2' 5.004" N	386460	5321282

Table 2.3 Preliminary Location – Production Installation

Production Installation – Center Point Coordinates– NAD 83 UTM ZONE 22N			
Longitude (DMS)	Latitude (DMS)	Easting (m)	Northing (m)
46° 23' 0.887" W	47° 57' 49.647" N	396720	5313202

The Project Area considers ancillary and potential future activities that may be carried out over the life of the Project.

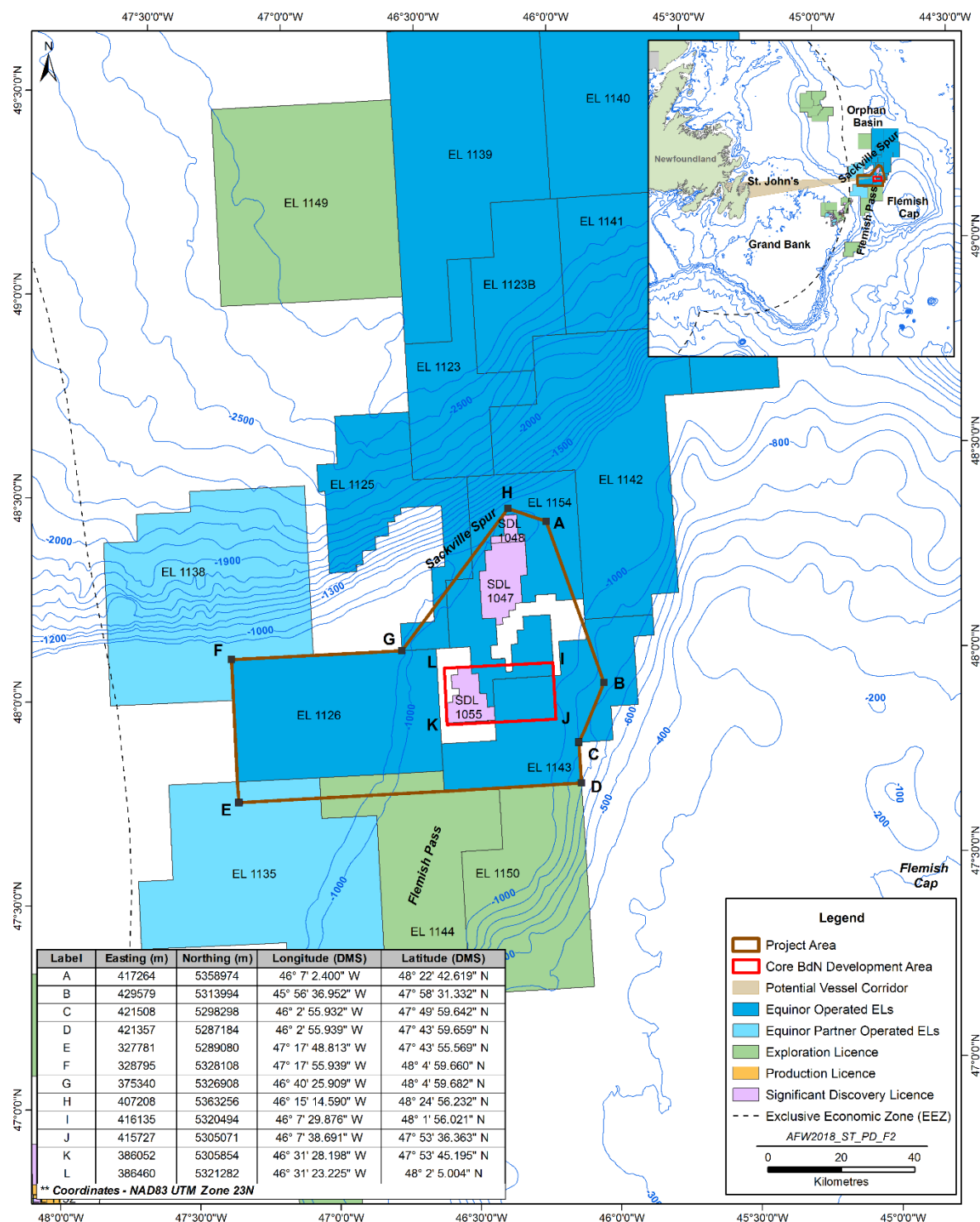
The Project Area also includes lands adjacent to the Core BdN Development Area. Should future resource potential be discovered, these areas could be developed and produced from the BdN production installation through the addition of subsea tie-backs. Equinor Canada has majority interest in other ELs and SDLs in the area (Figure 2.1) with future tie-back opportunities. These areas may be included in future development opportunities and are therefore included in the Project Area.

The closest operating offshore oil and gas production facility is White Rose, located approximately 240 km to the southwest of the proposed Project Area.

2.2 Project Overview

The Core BdN Development is comprised of the BdN field and the Baccalieu discovery. The Core BdN Development has an estimated mean economically and technically recoverable resource of approximately 47.7 million cubic metres (approximately 300 million barrels) of crude oil. The crude oil in the Core BdN Development is a light crude with an approximate API (American Petroleum Institute) of 36° and a low gas to oil ratio.

A drainage strategy for the Core BdN Development is currently under development. The drainage strategy is based on water and produced gas injection for pressure support. It is anticipated that core field production could be between 12-20 years. The proposed Core BdN Development is a subsea development which may include multiple templates and/or individual satellite wells (combined templates/satellites between five and 10) tied back via flowlines to a ship-like floating production storage offloading installation. The total number of wells for the Core BdN Development is estimated to be between 10 and 30 wells. Figure 2.2 provides an illustration of a typical subsea development and is representative of the Core BdN Development.



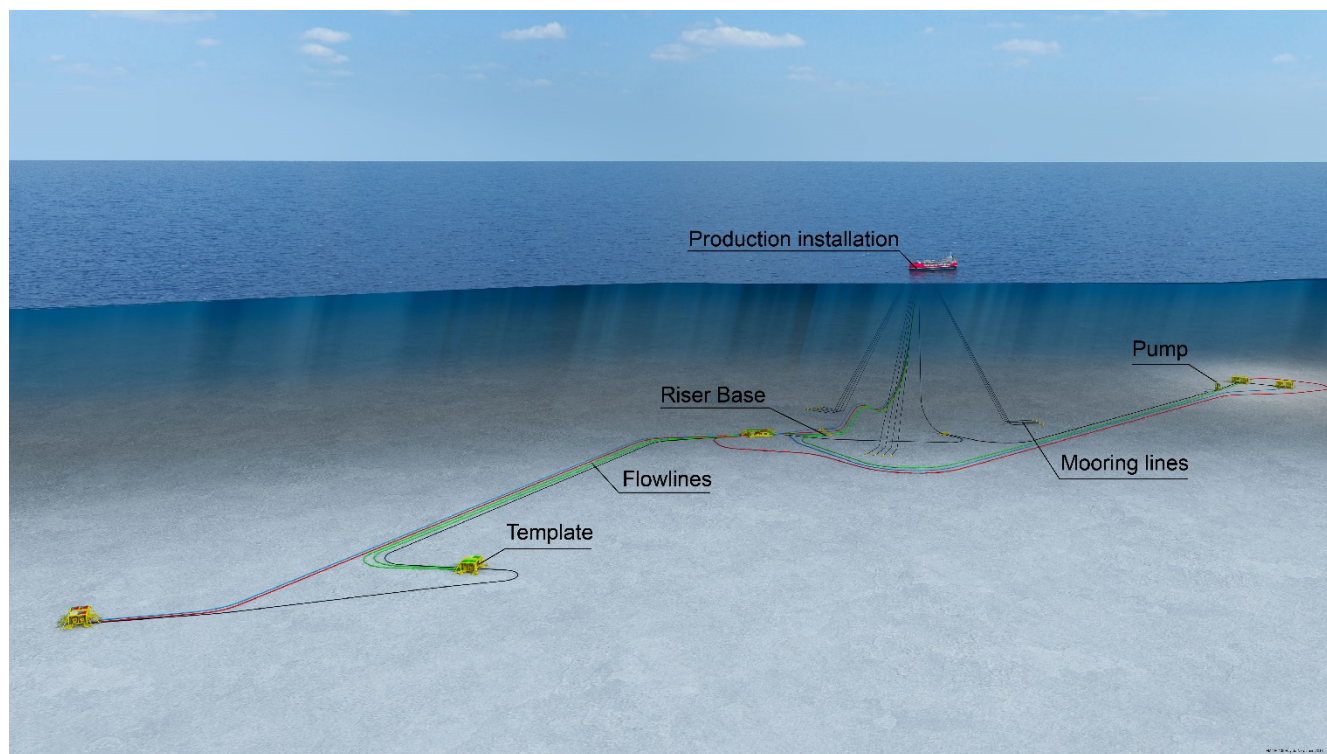


Figure 2.2 Illustration of a Typical Subsea Development

Potential future development may be comprised of tie-backs of subsea templates to the existing production installation and/or subsea infrastructure. Future tie-backs would not increase the maximum production rates, but rather would serve to extend the life of the field and operations as the hydrocarbons in the Core BdN Development are produced and decline.

As described above, the Core BdN Development is at a conceptual stage of planning, which means that details regarding project design and reservoir management are under development. The following overview is a conceptual plan, which will be modified as design progresses. Figure 2.3 provides an illustration of a potential layout of the Core BdN Development. Project design is ongoing and the layout may change during detailed design and optimization.

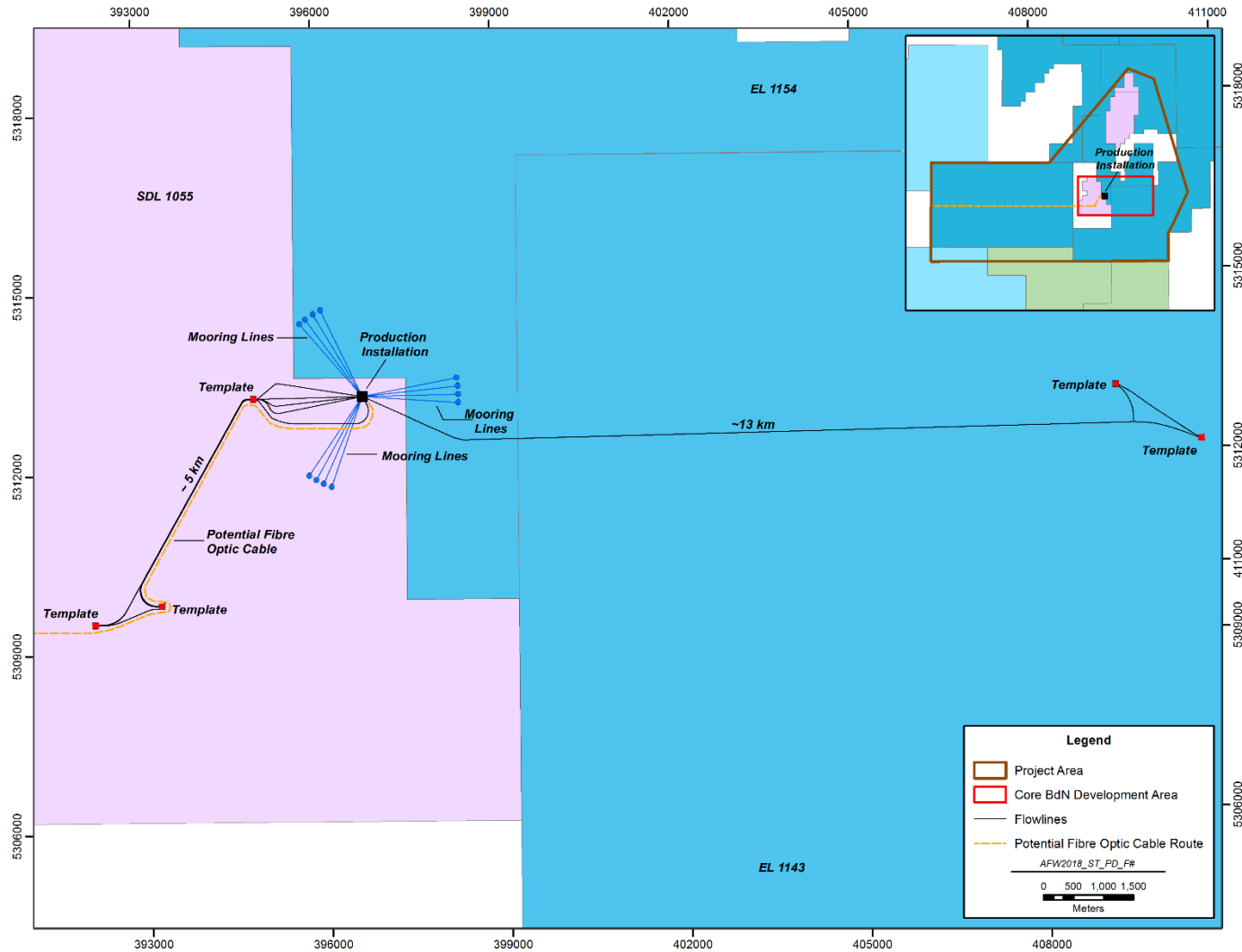


Figure 2.3 Illustration of Potential Layout of Core BdN Development

2.2.1 Project Components and Activities

The Core BdN Development includes the offshore construction, installation, hook-up and commissioning, drilling and life of field well support, operations and maintenance, and decommissioning of an oil and gas production installation. The Project includes all activities, including supporting activities, associated with offshore drilling and production facilities such as vertical seismic profiling (VSP) surveys, 3D / 4D surveys, ice management operations, diving programs, remotely operated vehicle (ROV) / autonomous underwater vehicle (AUV) / video surveys, environmental and geotechnical surveys.

The Project may also include future development activities such as development drilling, geophysical surveys, geotechnical surveys, environmental surveys, and potential subsea tie-backs of templates to the existing production installation that may be required should future development opportunities arise.

As described above, the Project consists of the Core BdN Development and potential future development. Table 2.4 provides an overview of the key activities and temporal scope for these Project phases.

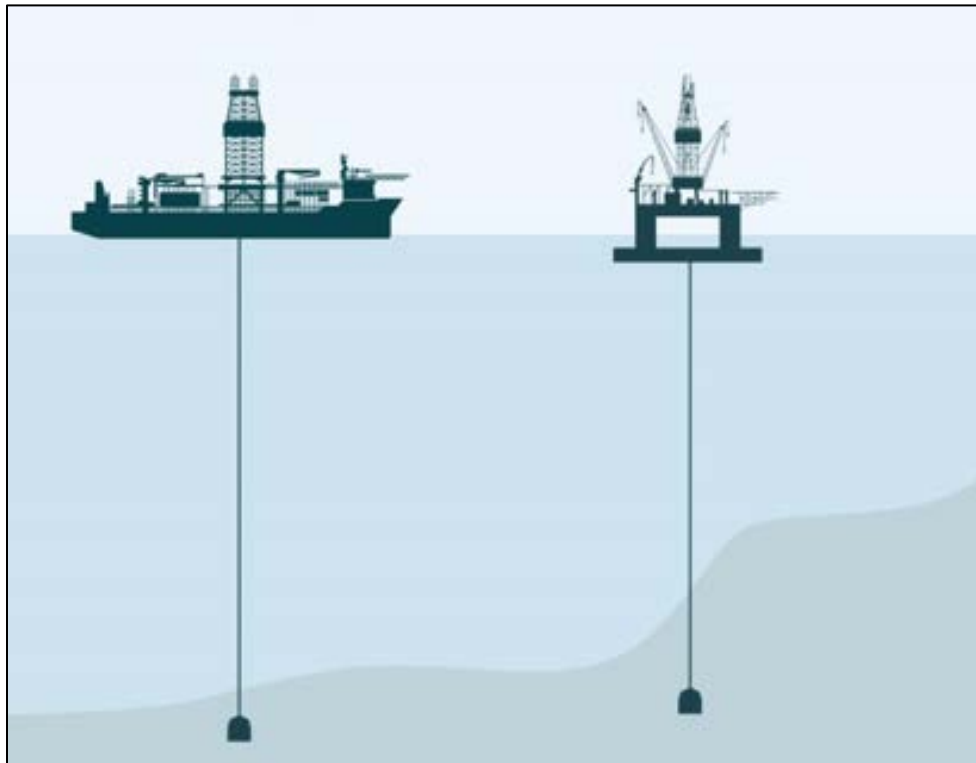
Table 2.4 Overview of Core BdN Development and Potential Future Development Activities

Component	Core BdN Development	Potential Future Development
Field life	12-20 years	Extension of core field life to maximum of 30 years
Drilling	Between 10 to 30 development wells	Up to an additional 20 development wells
Subsea templates, including individual satellite wells	5-10	1-5
Construction / installation / hook-up and commissioning	Seasonal over 3 -5 years	As required depending on need for tie-backs
Production/maintenance activities	Life of field - 12 to 20 years	Would be extended with life of field extension
Supporting activities	As required year-round, throughout life of field	As required year-round throughout extended life of field
Production installation	New build	Tie back to existing installation or subsea infrastructure
Area	Core BdN Area, see Figure 2.1	Project Area, outside the Core BdN Area - see Figure 2.1
Production Rates	Maximum rates as described in Section 2.2.1.2 below	Maximum rates will be the same as Core BdN Development

2.2.1.1 Development Drilling

The Core BdN Development Project may involve the drilling of 10 to 30 development 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. Pre-drilling of wells may be carried out before the production installation is on site. Drilling will likely occur over a three to five-year timeframe, once drilling commences. Well location planning to optimize resource recovery is ongoing, therefore final well locations are not defined.

Drilling will be carried out by one or more mobile operating drilling units (MODU) suitable for drilling throughout the year and under the environmental conditions of the Project Area. Either a semi-submersible drilling unit or a drill ship will be used (Figure 2.4). Wells will be maintained throughout the life of field using one or more MODU, drillship, light well intervention vessel or Inspection, Maintenance and Repair vessel. As drilling units are procured through a competitive bid process, the specific drilling unit is not known at this point. Drilling will occur year-round. Based on the water depths in the Core BdN Development Area, the drilling unit will maintain positioning using dynamic positioning system, without the use of a mooring system.



Source: Adapted from Maersk, no date

Figure 2.4 Schematic of a Drillship (left) and Semi-Submersible (right)

Wells are typically drilled in two phases: (1) drilling without a riser installed and (2) drilling with the riser installed. During riserless drilling, the surface and conductor sections, are typically drilled with seawater or water-based drilling mud (or fluid) (WBM) with the cuttings discharged at the seafloor, in accordance with the Offshore Waste Treatment guidelines (OWTG). Once the initial

sections are drilled, a steel casing is cemented in place to prevent the wall of the wellbore from caving in and to prevent the seepage of muds and other fluids. The riser and blowout preventer (BOP) are then installed onto a wellhead. The riser is a large diameter pipe that acts as a conduit connecting the rig to the wellhead through the water column, and the wellhead provides structural integrity to house the BOP and pressure integrity for drilling operations. A BOP is a system of high pressure valves that prevent water or hydrocarbons from escaping into the environment in the event of an emergency or equipment failure. The remaining sections of the well are drilled to predefined depth using either WBM or synthetic-based drilling muds (SBM). At intervals along the well, casing is cemented in place at set depths to reinforce the wellbore. Once development wells are drilled to depth, the BOP is removed and a 'Christmas tree' is installed on the wellhead. The tree is an assembly of valves, spools, and fittings used for different types of wells including production and injection wells. The primary function of a tree is to control the flow into or out of the well.

Drilling activities may also include batch drilling, which is the process of consecutively drilling the top hole portions of a well for multiple wells. During batch drilling activities, the conductor hole section and surface hole section are drilled riserless using WBMs and cuttings will be discharged at sea at the seabed.

Well interventions and workovers are possible throughout the life of field and are necessary to maintain the wells and optimize performance. Interventions and workovers could use a drilling rig or vessel (as listed above) to perform scope on the well(s). This type of work may occur three to five times during the life of field or as required if needed for safety reasons. Section 2.4 provides information on the anticipated discharges and emissions associated with drilling activities.

Typically for development drilling, well flow testing is not carried out and therefore is not considered within the scope of the Core BdN Development. Equinor Canada recognizes that should an EA be required under CEAA 2012, the scope of the Project will be set by the CEA Agency.

2.2.1.2 Subsea infrastructure

Current design plans for subsea infrastructure consist of mooring lines and anchors, multiple wet tree wellheads, templates, flowlines (similar to a pipeline) and risers (i.e., vertical flowlines from seafloor to the production facility). Figure 2.2 (above) provides a general illustration of flowlines, risers and mooring lines.

For the Core BdN Development, between five and 10 templates may be tied-back to the production installation. Since the water depth in the Core BdN Development Area is between 1,000 and 1,200 m, there is no likelihood of iceberg scour. Therefore, there is no plan to use excavated drill centres, as are used on the shallower Jeanne d'Arc Basin area, to house the subsea well equipment. The need for protection of the subsea installations from dropped objects or other interference will be assessed. Protection measures may include rock dumping over flowlines, installation of subsea wellhead protection equipment, trenching of flowlines, and/or concrete mattresses.

2.2.1.3 Production Installation

The Core BdN Development will include a floating production installation with onboard storage for crude oil. With a water depths between 1,000 m and 1,200 m, the use of fixed or seabed mounted structures are not feasible. The production installation is moored offshore in a fixed location (refer to Figure 2.2).

Production facilities will have the capacity to handle the requirements of crude oil production, storage and export, gas management, water injection, and the management of produced water and other wastes for a design life of 30 years. Crude production rates are estimated to be between 15,000 Sm³/d to 30,000 Sm³/d (approximately 94,000 to 188,000 BOPD). Crude storage capacity could be between 143,000 m³ to 191,000 m³ (0.9 million to 1.2 million barrels) of crude oil. The estimated produced water production rate ranges from 30,000 m³/d to 50,000 m³/d.

The production installation and the subsea equipment will be constructed at existing fabrication yards either locally or internationally depending on capacity and fabrication requirements. Therefore, the activities associated with construction/fabrication of the production installation and/or subsea equipment are not included in the scope of the Project. The Project scope does not include the establishment of Project-specific construction or fabrication facilities. Equinor Canada recognizes that should an EA be required under CEAA 2012, the scope of the Project will be set by the CEA Agency.

Figure 2.5 is a photograph of Husky Energy's White Rose Floating Production, Storage, and Offloading (FPSO) installation, an example of a typical floating production installation operating offshore Newfoundland.



Figure 2.5 Typical FPSO - Husky Energy White Rose FPSO

2.2.1.4 Offshore Construction, Installation and Hook-up and Commissioning

Offshore construction, installation, hook-up and commissioning refers to activities that will occur offshore at the Core BdN Development location. As stated above, the production installation and subsea infrastructure will be built at existing fabrication yards. Offshore construction and installation includes the installation of subsea equipment including:

- Drilling templates
- Flowlines/pipelines and subsea infrastructure (including umbilicals), as well as hook-up thereof
- Risers
- Installation of a fibre optic cable in the Project Area

Hook-up includes tie-in and connection operations to connect flowlines/pipelines/umbilicals between drilling templates, to risers and the production installation. Flowlines/pipelines will be flooded and leak-testing will be performed.

Offshore construction / installation and hook-up and commissioning will likely be carried out over three to five years, and likely limited to 'summer' seasons due to weather limitations associated with the offshore construction seas. If required, subsea infrastructure protection measures may be installed.

Telecommunications will be provided either through fibre optic cable or satellite communications. Options for fibre optic include installing a dedicated system from shore or connecting to an existing offshore marine fibre optic cable system. The routing of a potential fibre optic cable has not been determined. The scope of the Project includes the installation of the fibre optic cable within the Core BdN Development Area. Telecommunication fibre optic cables have historically been exempt from environmental assessment and Canadian permitting requirements. Activities associated with the installation of telecommunication cable in the Project Area may include, but not limited to the following:

- Ship-towed grapnel to clear cable path
- Cable laying vessel to install cable
- Hook-up of cable at sea floor (ROV) and to production installation

Activities associated with the above activities include, but are not limited to: pre-clearance surveys, site preparation, geotechnical and/or geophysical surveys, ROV / AUV surveys and environmental surveys. Vessels engaged to carry out and/or support these activities are listed in Section 2.2.1.7 and include helicopter support for transport of personnel and/or cargo.

Equinor Canada recognizes that should an EA be required under CEAA 2012, the scope of the Project will be set by the CEA Agency

Discharges and emissions associated with offshore construction, installation, hook-up and commissioning activities, as described in this section, are described in Section 2.4.

2.2.1.5 Production and Maintenance Operations

Crude production rates are estimated to be between 15,000 Sm³/d to 30,000 Sm³/d (approximately 94,000 to 188,000 BOPD) and crude storage capacity could be between 143,000 m³ to 191,000 m³ (0.9 million to 1.2 million bbls) of crude oil. Produced water production rate is estimated to range from 30,000 m³/d to 50,000 m³/d. Options for management of produced water include re-injection into the reservoir or discharge overboard after treatment. Excess associated gas will be re-injected into the reservoir.

The following activities are typically carried out during normal production and maintenance operations:

- Power generation
- Operation of utilities system, including but not limited to heating, cooling, ventilation, power, and corrosion protection systems if required;
- Desalination of seawater for potable water
- Waste generation and disposal
- Operation of produced water treatment and management system (re-injection or overboard discharge)
- Operation of seawater systems (cooling, firewater)
- Provision of required water (potable, fire water, cooling, industrial water)
- Operation of oil storage and offloading of crude
- Maintenance and inspection activities, including welding and x-ray inspection
- Flaring in connection with start-up, emergency and maintenance activities (vessel depressurization, etc.)
- Cargo / fuel / chemical handling

Power generation on the production installation will be provided by reciprocating dual fuel (gas / diesel) engines or dual-fuel turbines.

Maintenance of process and utility systems include regularly scheduled major shutdowns/turnarounds in line with established industry / company practice. In addition, marine systems and hull will be maintained according to the class societies and flag state requirements.

Pressure and leak-testing of the subsea systems including pipelines and flowlines is carried out during commissioning. No testing is planned during the operational phase other than routine inspections such as checking for lack of cover, free-spans and evidence of interaction with fishing. The pipelines will be designed to accommodate "intelligent pigging" inspection if necessary, whereby a remote sensing "pig" will be conveyed through the pipeline to undertake checks on and confirm pipeline integrity and condition.

Ongoing Project design will investigate options to minimize flaring. It is anticipated that there will be no routine flaring of produced gas from the production installation. Excess produced gas (i.e., gas which is not used for power generation) will be reinjected into the reservoir. During start up and shutdown and during upset process conditions, depressurization of process segments may be required for safety reasons, and gas will be sent to the flare. A flare tower will be provided to assure safe release and burning of the product. Current design options include a segregated flare system that includes a high-pressure (HP) and a low-pressure (LP) system. Under normal

operating conditions, no gas is flared via the HP flare. Primary sources of gas to the LP flare system would be produced water degassing and cargo tank blanketing. Options for the recovery of these sources of produced gas are being evaluated.

Potable water will be produced from a desalination plant onboard the production installation.

Crude oil will be offloaded to shuttle tankers via a flexible hose from the production installation to a shuttle tanker. Up to 8,000 m³/hour of crude could be offloaded. Crude oil will be shipped via these shuttle tankers to an existing transshipment facility or directly to market using international shipping lanes. Once the shuttle tanker leaves the Project safety zone, it is under the responsibility of the third-party owners of the shuttle tankers, outside the care and control of Equinor Canada, Husky Energy and/or the Project. The shuttle tankers would be subject to international maritime requirements (i.e., International Maritime Organization [IMO]) and must adhere to the regulatory framework of the IMO and those of its flag state. Shuttle tankers will use existing international and Canadian shipping lanes. If travelling within Canada's Exclusive Economic Zone (EEZ), shuttle tankers are required to have arrangements with a Canadian marine response organization in the event of a spill. 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 included in the scope of the Project. Equinor recognizes that should an EA be required under CEAA 2012, the scope of the Project will be set by the CEA Agency.

Discharges and emissions associated with production and maintenance operations are described in Section 2.4.

2.2.1.6 Other Supporting Activities

Activities and surveys in support of drilling and production operations, which may be carried out from time to time, include: well intervention; 2D / 3D / 4D seismic surveys; VSP programs; geotechnical and/or geological surveys, wellsite / geohazard surveys, environmental surveys and ROV / AUV surveys. The Project also includes all the ancillary facilities and activities typically associated with an offshore oil and gas production operation. Vessels to support these activities are listed in Section 2.2.1.7.

Geophysical / Geohazard / Wellsite and Seabed Surveys: These surveys are used to identify unstable areas beneath the seafloor (i.e., shallow gas deposits), hazards (large boulders, ocean debris, shipwrecks) so as to avoid these hazards when drilling, or corals. Surveys typically take between 5 to 21 days to complete but can be shorter (i.e., coral surveys) or longer, depending on the area to be surveyed and weather/operational delays. These can involve the mapping of the seabed through the use of seismic sound sources, multibeam echosounder, side-scan sonar, sub-bottom profiler, video, and other non-invasive equipment. The equipment is deployed either as hull-mounted equipment, on a towfish or on ROV / AUVs. Geohazard surveys may not be required for each well location; existing geophysical data may be used to analyze potential geohazards. These surveys may occur at any time of the year over the temporal scope of the Project.

2D/3D/4D Surveys: Over the life of the Project, seismic surveys may be undertaken to access and revalidate previous seismic data. Any required 2D/3D/4D surveys will take place within the Project Area. 2D seismic programs tend to cover relatively large geographical areas, in order to identify

sites or zones that may warrant further investigation, and they are therefore of relatively short-term duration. These surveys typically use one sound source array and often employ a single streamer. 3D surveys are typically more focussed and tend to cover smaller geographical areas than 2D surveys. Multiple sound source arrays are typically used and the vessel could tow between 8 and 16 streamers. 4D surveys, also known as "time lapse seismic" simply means that successive 3D survey data sets for the same area are interpreted to define changes in the reservoir over time. A typical application of this technique is using previous 3D seismic data and comparing it with a recently acquired 3-D survey. Therefore, the activities associated with a 4D survey are similar to a 3D survey (multiple sound source arrays and streamers), and the data collected is then compared to previous 3D seismic data for the same area. In both 3D and 4D seismic surveys, hydrophones may be laid on the seafloor, rather than towed behind the vessel.

VSP Surveys: VSP is a tool used to further define the depth of geological features and potential petroleum reserves by obtaining high resolution images of the target. VSP surveys will be conducted as required throughout the Project life.

VSP surveys are similar to surface geophysical surveys in that a sound source and a receptor (or hydrophone) is required to measure the refraction and reflection of the sound waves, thereby providing data that can be interpreted to delineate geological features used to identify potential hydrocarbon deposits. VSP differs from surface geophysical surveys in that it is conducted in a vertical wellbore using hydrophones inside the wellbore and a sound source near the surface at or near the well. A VSP is quieter and more localized than a surface geophysical survey, being smaller in size and volume. Up to 12 individual smaller sound sources may be used for VSP, each of which has a maximum volume of 250 cubic inches and is generally placed 5 to 10 m below the water surface. Additionally, a VSP is shorter in duration than surface geophysical surveys, with VSP operations usually taking less than 48 hours per well to complete the profiling.

During a VSP program, various VSP configurations are used depending on the objectives. For example, an offset VSP is the conventional configuration, in which the energy source is positioned directly above the hydrophone(s), typically close to the wellbore. A walkaway VSP is where the sound source is towed from a vessel and is moved progressively away from the hydrophones, generally resulting in higher resolution than surface data and providing more continuous coverage than an offset VSP. VSP surveys may be carried out at any time of the year.

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 (DFO 2007; and appended to the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2017).

Environmental Surveys: These surveys are conducted to collect samples to analyze the physical, chemical, and biological aspects of the selected area. Sampling is typically carried out from a support / supply vessel or a dedicated vessel suitable to the survey. Environmental surveys may include oceanography, meteorology, and ice / iceberg surveys. It can also include biota, water, and sediment sample collection, and ROV-video or drop camera surveys. Environmental surveys may occur throughout Project life at any time of the year using vessels of opportunity associated with the Project, typically taking between five to 21 days to complete.

Geotechnical Surveys: These surveys measure the physical properties of the seabed and subsoil through the collection of sediment samples and in-situ testing. Methods to collect the samples typically include drilled boreholes or gravity coring. In-situ testing is done through cone penetration testing and pore pressure measurements. Installation of piezometers in boreholes to measure soil properties may also be carried out. Piezometers could be left in place to collect data for up to 12 months or longer. Geotechnical surveys may occur throughout the Project life at any time of the year, using dedicated vessels provided by marine geotechnical specialist suppliers.

ROV / AUV surveys: These surveys are used to conduct visual inspections (camera equipped) of facilities. ROV / AUV surveys may also be used during pre-drill surveys and before marine installations to determine presence / absence of physical objects on the seafloor. They may also be used during any or all of the surveys described above to support drilling operations. They will be conducted throughout the Project-life at any time of the year using vessels of opportunity associated with the Project.

2.2.1.7 Supply and Servicing

Offshore drilling and production activities are supported by various logistical activities, including existing onshore supply bases, offshore supply and support vessels, and helicopters.

A supply base provides temporary storage, re-fuelling, staging and loading of materials and supplies to support offshore drilling and production activities. Shore base facilities have operated on the island of Newfoundland since the 1970s when offshore exploration activity began. Shore base facilities are owned and operated by independent third-party service providers providing services to multiple clients, including ongoing oil and gas operations, and are subject to provincial and / or municipal regulatory requirements. These facilities operate with the required government permits and approvals and are certified as compliant port facilities under the *Marine Transportation Security Act*. Equinor Canada does not have care or control of operations or modification at these onshore supply bases. As this will be the fifth offshore development in NL, it is not anticipated that any significant construction or modifications would be required at contracted supply bases in support of the Project. Therefore, the supply base and associated activities are not considered within the scope of the Project. Equinor recognizes that should an EA be required under CEAA 2012, the scope of the Project will be set by the CEA Agency.

Offshore supply vessels will be engaged to support Project activities. Supply vessels will be contracted from third-party suppliers to provide support in transporting of equipment, supplies and personnel. Equinor Canada has yet to engage the services of support vessels for the Project. Supply vessels contracted for the Project 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 marine-vessel vetting requirements.

The following Project vessels are likely to be engaged during the Project life:

- Offshore construction vessels
- Light intervention vessels
- Inspection, Maintenance and Repair vessels

- Accommodation vessels
- Diving vessels
- Cable / pipe / flowline laying vessels
- Support/supply vessels
- Vessels for geotechnical, geophysical, seabed surveys, and/or environmental surveys
- 2D / 3D / 4D Seismic vessels
- Helicopter support
- Vessels for ROV / AUV surveys
- Ice management vessels
- Support / picket vessels for any of the above

Equinor Canada will not be establishing new fabrication or construction facilities for the Project. Rather, it will engage, through a competitive procurement process, contractors to fabricate and/or procure the components of the Project. These services will be provided from third-party owned and operated existing fabrication and construction yards in either the province, Canada, or internationally. It is not anticipated that any significant construction or modifications would be required at any of the yards and facilities for the Project, or that substantively new types of activities would be established at the yards and facilities. These facilities operate with the required government permits and approvals.

2.2.1.8 Decommissioning

Removal of the infrastructure, including plugging and securing of the wells, will be performed in accordance with rules and regulations at the time of abandonment. A detailed plan for the cessation activities will in due time describe the solutions for the different elements of the field.

Mandatory operational requirements for abandonment and decommissioning will be based on C-NLOPB operational requirements as a minimum. The regulatory requirement is to submit a decommissioning and abandonment plan as part of the Development Plan Application. The Development Plan should “describe the provisions, included in the design to facilitate decommissioning and abandonment of the installation at the end of its production life. An overview plan of the decommissioning and abandonment program and a discussion of the feasibility of the proposed procedures should be provided. A description of the measures that would have to be taken to leave the site in a fishable and navigable state should be included” (C-NLOPB 2009)

As a minimum, the process plant will be emptied, and secured before removal of the production installation from the field. Pipelines will be shut down, cleaned and secured. Pipelines or subsea equipment that can represent a danger to future activities will be covered or removed from the seabed. Wells will be permanently abandoned per Equinor and regulatory requirements.

Discharges and emissions associated with decommissioning are described in Section 2.4.

2.2.1.8.1 Well Decommissioning

Well suspension and abandonment will adhere to the requirements set out under *the Newfoundland Offshore Petroleum Drilling and Production Regulations* SOR/2009-316. Suspension and abandonment involves the isolation of the well bore by placing cement and/or mechanical plugs at varying depths in the wellbore, thereby separating and isolating subsurface zones to prevent subsurface fluids from escaping. There may be instances when it is necessary to re-enter the wellbore. In such circumstances, the well is not abandoned but suspended. The same safeguards regarding wellbore isolation are implemented.

2.2.2 Potential Future Development

Over the life of the Project, Equinor Canada may choose to undertake additional activities (e.g., development drilling, 2D, 3D / 4D seismic) to search for and possibly develop economically recoverable reserves. These activities would be direct result of and/or caused by the operation of the production installation. Should additional economically and technically recoverable reserves be discovered within the Project area, they could be processed on the production installation through the installation of additional subsea templates and flowlines (as described in Section 2.2.1.2). The production installation and associated facilities will be designed to accommodate between one and five subsea developments could be tied-back to the production installation, and may include the drilling of up to 20 additional wells. Activities associated with potential future development would be the same as those described in Section 2.2.1. As described above, the Core BdN Development has a field life between 12-20 years. Should future development occur, the field life would be extended and maximum daily potential production rates would remain the same.

Tie-backs to the production installation are feasible up to a distance of approximately 40 km from the production installation location. Future development activities could therefore include development activities on Equinor Canada held lands within the Project Area.

2.3 Project Schedule

As the Core BdN Development is in the early design phase, a detailed schedule of activities is not yet available. The following is an overview of when project activities are likely to commence. This schedule may change during project design and construction.

The Core BdN Development is predicted to have a field life of 12 to 20 years. Project facilities (production installation, subsea equipment) are anticipated to have a design life up to 30 years, therefore the life of the Project is estimated to be 30 years. Offshore survey activities could begin as early as 2020.

Offshore construction and installation activities could commence as early as 2023, with hook-up and commissioning potentially occurring in 2024. First oil may be achieved by 2025. Decommissioning and abandonment would occur after field life. Project activities, as described herein, could occur at any time of the year.

Table 2.5 provides an overview of the estimated timeframe for each of the project activities phases as defined by the Project scope. Figure 2.6 provides a high-level schedule of proposed project activities.

Table 2.5 Anticipated Timing of Project Activities

Activities	Anticipated Timeframe
Pre-installation surveys Site preparation (if required) Offshore Construction / Installation / hook-up and Commissioning Installation of subsea equipment Installation of flowlines/pipelines insulation	Commencing as early as 2020 Offshore construction commencing as early as 2023 Activities would be carried out year-round.
Drilling (including pre-drilling and/or development drilling)	Commencement as early as 2023 Drilling for Core BdN Development will occur year-round for approximately three to five years.
Production/Operations/Maintenance	Commencement anticipated in 2025 Activities will be year-round and throughout life of Core BdN Development (12 to 20 years for Core BdN Development)
Geohazard surveys Geotechnical surveys Geological Surveys Environmental Surveys Seismic (2D / 3D / 4D)	Activities could commence as early as 2020 and carried out year-round to end of Core BdN Development
Decommissioning	Commencement at end of life of BdN field, activities could occur year-round until decommissioning is complete.
Potential future development	Any or all activities as described above, as required. Activities may be carried out year-round depending on activity, to end of Project design life.

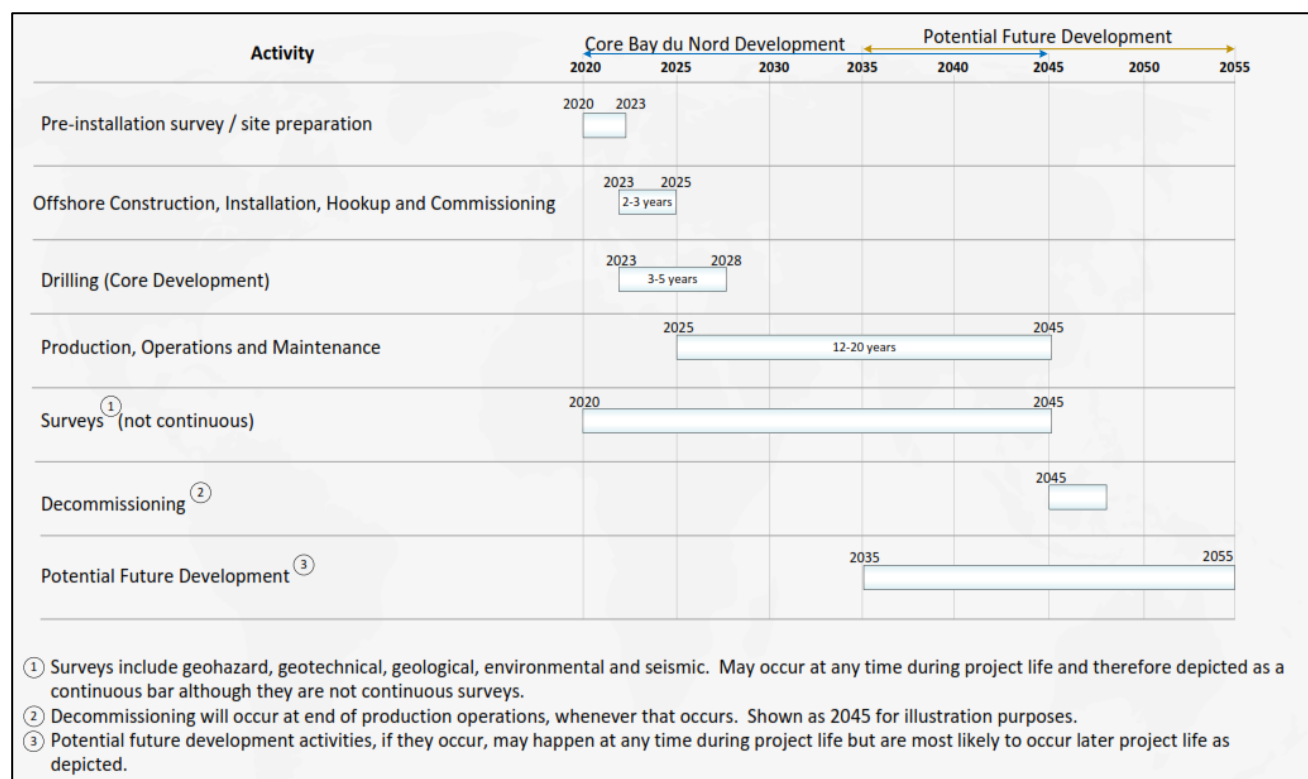


Figure 2.6 Preliminary Project Schedule

2.4 Discharges, Emissions and Waste and their Management

Potential environmental discharges that may be associated with the proposed Project include noise, light, atmospheric emissions, liquid discharges, drill cuttings discharges, and associated solid waste materials. The following sections provide a brief overview of the discharges, emissions and waste materials that may be generated during Project activities and how these will be managed.

2.4.1 Atmospheric Emissions

Atmospheric emissions during Project activities will include exhaust emissions from the production installation, drilling unit(s), vessels, and aircraft and emissions from flaring during production activities and during start-up, production turn-around, and shutdown. These air emissions will include: carbon monoxide, nitrogen oxides, total suspended particulates, fine particulate matter less than 2.5 and 10 microns, volatile organic compounds, sulphur dioxide, and greenhouse gases. Specific emission types and volumes will depend on a variety of factors, including offshore installation and power generation design, types and numbers of support vessels, and timing and duration of activities. An estimate of, and analysis regarding, potential Project-related air emissions will be provided in the EIS, as required. These air emissions will be in keeping with relevant regulatory requirements and standards, including the *Canadian Environmental Protection*

Act, National Ambient Air Quality Objectives/Standards and the *Newfoundland and Labrador Air Pollution Control Regulations* for specified criteria air contaminants, as well as relevant requirements under MARPOL.

It is estimated that there will be between 120,000 to 250,000 tonnes per year of carbon dioxide equivalent (CO₂e) emissions associated with the Core BdN Development, varying according to estimated production profile and uncertainties of estimates in this early planning phase. Annual CO₂e emissions from drilling are estimated to be between 70,000 to 85,000 tonnes. Total emissions from vessel traffic over the life of the field are estimated to be between 200 000 and 250,000 tonnes CO₂e. Assuming a Core BdN Development field life of between 12 and 20 years, total CO₂e emissions could be between 2.5 million and 4.5 million tonnes. These emissions represent 1.2 to 2.4 percent of the total provincial reported GHG emissions for 2015 (10,300,000 tonnes CO₂e or 10.3 Mt CO₂e) and 0.01 to 0.03 percent of the total national emissions (722,000,000 tonnes CO₂e or 722 Mt CO₂e) (ECCC 2017)

2.4.2 Sound and Light Emissions

Sound emissions into the atmospheric environment associated with an offshore oil and gas development project include those associated with drilling, production, vessel, and helicopter activities.

Artificial light emissions include installation and vessel lighting and flaring. Lighting will be kept to a minimum to the extent that it does not affect crew and vessel safety.

2.4.2.1 Underwater Sound

Underwater sound will be generated as a result of planned Project activities, including sound generated by the production installation (e.g., thrusters while station keeping /), drilling units (station keeping and drilling activities) and vessel activity. Sound will also be generated during geophysical (VSP and/or 2D/3D/4D seismic surveys), and from supply and supporting vessels.

2.4.3 Drilling Wastes

Drilling muds are fluids which lubricate and cool the drill bit and hole, circulate cuttings and carry them back to the surface, and help maintain appropriate hydrostatic pressure in the well to overbalance formation pressure, providing the primary barrier for well control (BOP forms part of the secondary barrier). The initial “riserless” sections of the well bore are generally drilled using WBMs, the primary component of which is seawater, with other additives including bentonite (clay), barite, and potassium chloride. Other approved chemicals are also added as required to achieve and control the required mud properties. WBMs and WBM-associated drill cuttings are discharged at the seabed in accordance with the OWTG. Once the conductor and surface hole sections are completed and the riser and BOP are installed, the deeper sections of the well bore are then typically drilled using SBMs, which are returned to the drilling unit via the riser. Once onboard the drilling unit, drilled (rock) cuttings are removed from the drilling mud in successive

separation stages. The muds are reconditioned and reused and spent SBM is returned to shore for disposal in an approved waste management facility. SBM-associated drill cuttings, treated in accordance with the OWTG, are discharged to the sea from the drilling unit. Total estimated volumes of cuttings that could be discharged, WBM and SBM cuttings combined, is estimated to range from 300 m³ to 1,000 m³ per well.

Cement constitutes a part of the well barrier envelope and is used during casing installation and plug and abandonment activities. For the initial riserless sections of the well, a spacer fluid is typically pumped ahead of the cement which is pumped down the drillstring and up the outside of the casing, with cement (and spacer fluid) returns to the seabed in riserless sections. For casing operations with the riser installed, cementing / drilling fluid interface is returned up the riser to the rig. For most casing cement jobs, the cement / spacer mud / mud interface will be left in the annulus; exceptions include lines and plugs, where cement may be circulated back to surface.

Drilled (hard) cement during the operation is discharged to seabed / sea when riserless. When drilling with the riser installed, drilled cement is processed by shakers and discharged overboard or captured in cutting skips and transported to shore.

2.4.4 Liquid Discharges

Liquid discharges generated by planned Project activities may include the following:

- Produced water
- Test fluids during commissioning and installation activities
- Cooling water (sea water to reduce temperature during processing)
- Bilge water (water that collects in the ships' bilge)
- Ballast water (water carried in ships' ballast tanks to improve stability and balance)
- Deck drainage (drains to collect ocean and rainwater runoff)
- Gray and black water
- Fire water (seawater for firefighting purposes; tested intermittently)
- Well treatment fluids (required to maintain fluid properties in the well)
- Desalination brine (bi-product in the desalination of seawater for potable water)
- Discharges from subsea equipment (BOP, risers, flowlines) (intermittent discharges during testing of equipment)

The OWTG sets performance standards for many of these discharges, and in some cases required sampling and analysis prior to ocean discharge. Liquid discharges that do not meet the standards set out in the OWTG for ocean disposal are transported back to shore for disposal at an approved licenced waste management facility. The EIS, if required, will provide a description and estimate of volumes of these liquid discharges. Produced water discharges would account for the greatest volume of all liquid discharges. The volumes of other liquid discharges, as identified above, are likely to be minor in comparison.

The selection and use of chemicals used in drilling and production operations that may be discharged to the marine environment will be screened and selected for use in accordance with Equinor's chemical management system, which follows the requirements of the Offshore Chemical Selection Guidelines (OCSG) for Drilling and Production Activities on Frontier Lands

(NEB et al., 2009). The OCSG provides a procedure and criteria for offshore chemical selection. Its objective is to promote the selection of lower toxicity chemicals to reduce the potential environmental effects of a discharge where technically feasible.

Produced water discharge rates are expected to be very low in the initial stages of production and increase over time to an estimated peak rate in the range of approximately 30,000 m³/d to 50,000 m³/d. Other discharges are anticipated to generally remain at a steady rate throughout the Project life. The volumes of other liquid discharges (e.g., grey water, ballast water, bilge, drains, etc.) are not known at this stage of Project planning. The EIS will provide additional information on produced water and other liquid discharges, as required.

2.4.5 Hazardous and Non-Hazardous Solid Wastes

Hazardous and non-hazardous wastes will be generated during Project activities. Equinor is committed to the establishment of safe and environmentally responsible procedures for the generation, storage, handling, transportation, treatment and disposal of all waste materials generated during the Project.

Hazardous wastes may include oily waste (filters, rags, waste oil), waste chemicals and containers, batteries, biomedical waste, waste dangerous goods, and naturally occurring radioactive material. These wastes 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. Non-hazardous wastes, including domestic waste, scrap metal, recyclables, and other miscellaneous non-hazardous wastes, will be stored in appropriate containers onboard and transported to shore. Once onshore, a third-party contractor will collect and dispose of the hazardous and/or non-hazardous wastes at an approved facility and in compliance with any federal and provincial regulations and requirements.

Waste food will be macerated to maximum particle size and discharged overboard in accordance with the OWTG.

Vessels used to support project activities will adhere to Canadian and international (*International Convention for the Prevention of Pollution from Ships* (MARPOL 73/78)) requirements, as appropriate for the handling and disposal of vessel waste material.

A waste management plan will be developed that outlines waste handling, storage and discharge criteria for the Core BdN Development.

2.5 Potential Accidental Events

Equinor maintains a strong commitment to safe, secure and sustainable operations. Central to this commitment is a corporate Safety and Sustainability management system. Equinor has developed a management system to capitalize on the collective knowledge and best practice gained over many years. The Management System contains the information needed to set on the right path when performing work. It is also how safe, secure and sustainable activities are ensured and risks are effectively managed. Equinor's emergency response philosophy is to reduce the impact of an

emergency on people, environment, and the integrity of Equinor, contractor, and third-party assets.

Equinor's objective in its operations is to ensure safe and efficient operations. During drilling and production operations control measures will be in place to prevent incidents from occurring. Potential accidental events that may occur during drilling and production activities include vessel collisions, loss of well control (e.g., blowout), batch spills (e.g., crude, diesel, SBM fluids), dropped objects, and other non-routine spills or releases from the drilling and production installations, subsea infrastructure, and/or support vessels.

The EIS, if required, will include spill modelling of batch spills and loss of well control events to assess the risk of adverse environmental effects that may occur as a result of these accidental events. An overview of Equinor's emergency response plans, including spill prevention, preparedness and response measures, will be provided in the EIS.

3 Environmental Setting

The following sections provide a brief description of the existing environmental setting that overlaps and may interact with the Project, including relevant components of the physical (geology, climate, oceanography, ice), biological (fish and fish habitat, marine and migratory birds, marine mammals, sea turtles) and human (fisheries, other human activities) environments that characterize the Project Area and surrounding region.

3.1 Previous Studies and Available Information: Eastern Newfoundland Offshore Area

Offshore oil and gas exploration and development activities have been occurring off Newfoundland and Labrador for several decades. Portions of the Canada-NL Offshore Area, including the Project Area, have been subject to previous environmental studies and assessments that are relevant to the Project and any EIS that may be required for it. The EAs and monitoring studies that have been carried out for offshore oil and gas activities provide important and valuable sources of information on the existing environmental setting in the region, as well as the potential environmental issues and interactions that may be associated with these activities. Furthermore, the potential effects and mitigation measures for the offshore are well known as a result of Equinor's global offshore expertise and previous assessments and monitoring in the NL Offshore.

Of particular relevance to this Project and its EA review, is the Strategic Environmental Assessment (SEA) for the Eastern Newfoundland Offshore Area (Amec 2014), completed by the C-NLOPB in 2014. The SEA presented regional environmental baseline information (physical, biological and socioeconomic) for offshore eastern NL and provided an overview of potential environmental issues, mitigation and planning approaches as input to future exploration licencing decisions by the C-NLOPB in this area. In addition, in late 2017 Equinor Canada prepared and submitted an EIS for exploration drilling, entitled the "Environmental Impact Statement for Flemish Pass Exploration Drilling Program" (Statoil 2017a) (the Drilling EIS). The Drilling EIS builds on the baseline information provided in the above referenced SEA and provides an analysis of potential effects from drilling in the Flemish Pass area. The core BdN Project is within the Drilling EIS defined project area. Together, these documents are key sources of regional environmental information for the BdN EIS.

Environmental effects monitoring (EEM) studies for existing development projects offshore NL have been ongoing since 1998. These data and results of these studies provide information regarding effects of development projects and will be useful reference the EIS, should one be required.

Since 2008 Equinor Canada collected biological, physical sediment, meteorological, and oceanographic data during its drilling and seismic / geotechnical surveys in the Project and surrounding areas. Subject to approval from its licence partners, Equinor will include these data in the EIS.

3.2 Physical Environment

The geology of the Eastern Newfoundland offshore area is complex and dynamic, and the current bedrock and surficial characteristics of the area have been shaped by various factors and processes over time. The Project Area is located over the Sackville Spur, northern portion of the Flemish Pass and Nose of the Grand Banks with depths in the central portion of the Project Area of about 1,100 m. The Sackville Spur extends the nose of the Grand Banks (to the southwest) where depths are about 500 m or less out to 1,000 m to the northeast.

Available climatological information for the Project Area (as summarized in Statoil 2017) indicates that air temperatures are coolest in February and warmest in August. Prevailing winds in the area are from the southwest to northwest in winter and from the south through west in summer, and mean hourly wind speeds range from about 7 m/s in summer to 12 m/s in winter. Over the Project Area, regional observations indicate rain or drizzle are the most frequent type of precipitation occurring about 10 percent of the time annually. The monthly frequency of rain events is lowest in July and August, and the snow occurrence frequency is at its peak in January and February. Maximum rain frequency occurs in October and November. Freezing rain and drizzle are relatively infrequent, occurring less than one percent of the time in any given month. The Project Area has a high occurrence of marine fog, with visibility being poor (500 m to 1 km) or very poor (less than 500 m) 20 percent of the time annually.

Mean significant wave heights over the Project Area are expected to be on the order of 2 m in summer and 4.5 m in winter, with maximum significant wave heights of about 15 m in February and 7 m in June. The largest waves are from the southwest through northwest. The cold Labrador Current dominates the general circulation of water off eastern Newfoundland. Mean current speeds typically range between about 5 and 20 cm/s, with maximum current speeds typically between about 30 and 70 cm/s, with maximum speeds up to about 100 cm/s. Average sea surface temperatures generally range from about 1.6°C in March to about 5°C in August and October (Statoil 2017).

The Project Area, like the rest of the Eastern Newfoundland offshore area, is subject to seasonal sea ice (winter and spring), and vessel icing during certain meteorological conditions. Sea ice and iceberg conditions may vary each year and by location and are influenced by colder or milder winter conditions over Newfoundland and the surrounding waters, and by seasonal wind patterns. Icebergs are present offshore eastern Newfoundland traditionally from about January through August with occasional sightings into the fall. Over the Project Area, icebergs have been observed from March through July (Statoil 2017). Sea ice may be present in the Project Area between January and April with a much greater likelihood of occurrence in the western and southern portions, and conversely a lower likelihood in the northeast.

3.3 Biological Environment

Marine fish, birds, marine mammals and sea turtles occur in the Project Area. This includes some 23 species of fish, two species of marine bird, seven species of marine mammals and two species of sea turtles that are considered to be at risk or otherwise of conservation interest (i.e., listed

under the *Species at Risk Act* or assessed by the Committee on the Status of Endangered Wildlife in Canada).

The presence, abundance and distribution of specific fish species varies considerably based on habitat characteristics (both abiotic and biotic) and variability across this marine environment, which includes parts of the Flemish Pass and adjacent slope habitats. Within these areas and in the larger surrounding region and its associated habitat types, a variety of fish species and assemblages occur with “shallow water” groups (e.g., American plaice, witch flounder, Atlantic cod, redfish and wolffish) giving way to “slope” assemblages (e.g., Greenland halibut, roughhead grenadier, wolffish) and finally to “deep slope-abyssal assemblages” (e.g., Greenland halibut, grenadiers, blue hake, dogfish) (Amec 2014; Nogueira et al 2016). Within such depth zones, habitat complexity can also be a determining factor of species presence and prevalence. In addition to fish species that are resident in the Project Area, there are species that may pass through the region during feeding or spawning migrations (e.g., American eel, Atlantic salmon, tuna, swordfish).

Benthic invertebrate species known to occur within the Project Area include polychaetes, whelks, echinoderms, isopods, crustaceans, and molluscs. Deep water corals, sponges, and sea pens have been recorded within the Project Area, primarily in the vicinity of the Flemish Pass and around the edges of the Grand Banks and Flemish Cap. Bottom trawling and video surveys have identified over 50 species of corals and sea pens along the shelf of the Flemish Pass, Flemish Cap and northeast slope of the Grand Banks (Wareham 2009; Murillo et al 2011; Beazley et al 2013; Vázquez et al 2013; Baillon et al 2014a, 2014b; Beazley and Kenchington 2015). Modelling of coral distributions against environmental parameters indicated the association of coral species to specific depth ranges, particularly on shelf slopes (Guijarro et al 2016). Coral biomass is mainly distributed along the slopes of the Flemish Pass and Flemish Cap with fewer observations on the adjacent Grand Bank Shelf and on top of the Flemish Cap (Murillo et al 2011). Several dozen species of sponges have also been observed in and around the Project Area (Murillo et al 2012, 2016a, 2016b; Beazley et al 2013; Knudby et al 2013; Beazley and Kenchington 2015). Of the identified species, many have wide depth ranges of 100-1,500 m indicating they can occupy slope and shelf areas in the region. These organisms increase habitat complexity, provide habitat to fin fish and shellfish species. These species are of conservation interest and some areas have been designated as Vulnerable Marine Ecosystems (VMEs) due to their role in marine habitat development, and their sensitivity to stressors on the environment, including anthropogenic impacts such as fishing and oil and gas activities.

The Project Area is primarily within the Flemish Pass area, which is known to support an abundance of seabird species. A diverse assemblage of seabirds can be found in the marine waters off eastern Newfoundland at all times of year, including gannets, phalaropes, large gulls, kittiwakes, terns, alcids (auks), jaegers and skuas, fulmars, petrels and shearwaters (Amec 2014). The nutrient-rich Grand Banks and Flemish Cap regions off eastern Newfoundland serve as a major feeding area for dozens of marine bird species throughout the year, particularly during the summer months. Many seabird groups such as cormorants and terns tend to have a more coastal distribution and are therefore rarely observed this far offshore. Waterfowl occur in large numbers in marine habitats off eastern Newfoundland, especially during the winter months, but they prefer

open water in coastal areas and are thus not likely to frequent the offshore environments that characterize the Project Area (Amec 2014).

Marine fauna found off eastern Newfoundland also include some 20 marine mammals and several sea turtle species, many of which are considered to be at risk or otherwise of special conservation concern. The existing and available information indicates that marine mammal species that are known or considered likely to occur offshore eastern Newfoundland include a number of mysticetes (baleen whales), odontocetes (toothed whales and porpoises) and pinnipeds (seals). In addition, two sea turtle species have been regularly observed off eastern Newfoundland. These marine mammal and sea turtle species differ considerably in their likelihood of presence and in the particular locations and habitat types that they utilize and the times at which they occur in or pass through the region. Key feeding grounds such as the Grand Banks are of particular importance to marine mammals and turtles, and several Ecologically and Biologically Significant Areas (EBSAs) have been identified due in part to their known importance to a number of marine mammal species.

A number of land-based, coastal and marine areas within and offshore eastern Newfoundland have been designated as protected under provincial, federal and/or other legislation and processes, or have been formally identified as being otherwise special or sensitive due to their ecological, historical and/or socio-cultural characteristics and importance. Given its location approximately 450 km offshore, the Project Area will not overlap or interact directly with any of the existing provincial or federal protected areas on or around the Island of Newfoundland. The Project Area likewise does not overlap with any of the Canadian Marine Refuges, Fisheries Closure Areas, EBSAs or Preliminary Representative Marine Areas that have been identified off Eastern Newfoundland and within the Canadian EEZ (Figure 3.1).

As illustrated in Figure 3.2, the Project Area does overlap with portions of several internationally designated special areas off Eastern Newfoundland, including: a Convention on Biological Diversity EBSA (Slopes of the Flemish Cap and Grand Bank), a VME (Sackville Spur) and one Northwest Atlantic Fisheries Organization (NAFO) Fisheries Closure Area (Northwest Flemish Cap – 10), for which there are no known prohibitions of marine activities such as those being proposed as part of this Project.

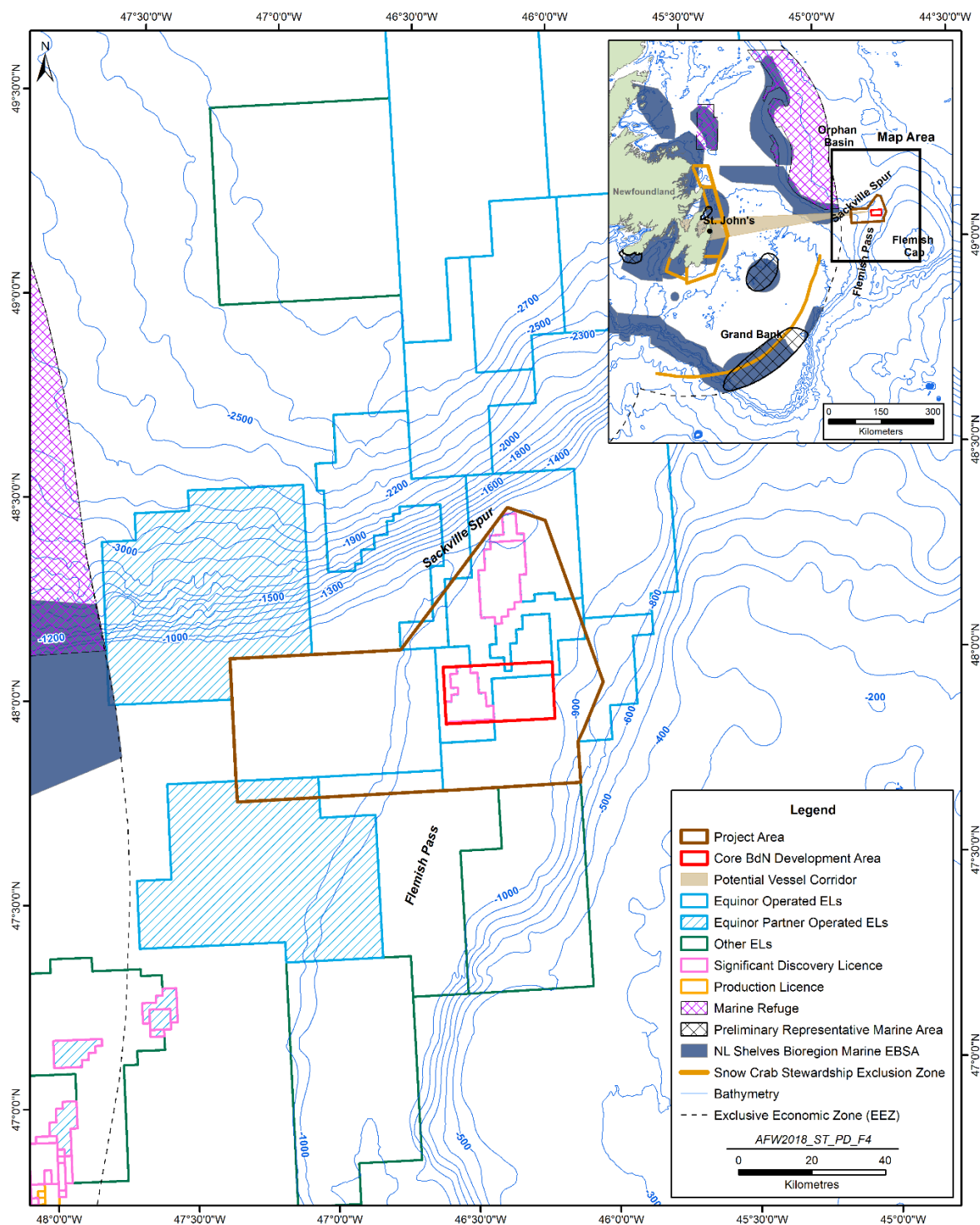


Figure 3.1 Identified Special Areas in Proximity to the Project Area (Canadian Designations)

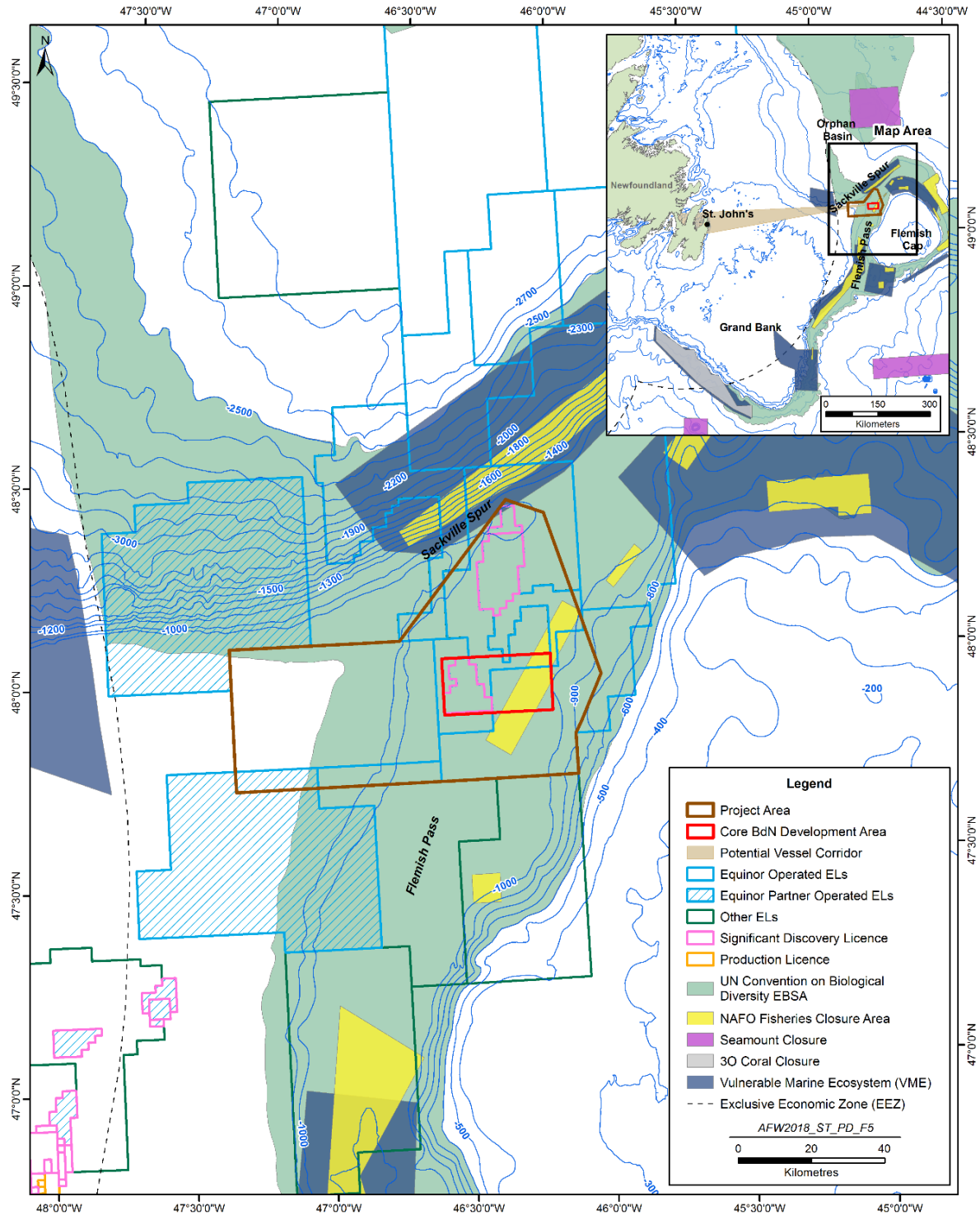


Figure 3.2 Identified Special Areas in Proximity to the Project Area (International Designations)

3.4 Human Environment

The Project is located outside Canada's 200 nm EEZ on the outer continental shelf. The Canada-NL Offshore Area, as defined in the Accord Acts, includes those lands within the Canada's 200 nm EEZ or to the edge of the continental margin, whichever is greater. The CEAA 2012 defines "federal lands" as those lands that include the continental shelf of Canada. Therefore, the Project will be carried out on federal lands. The C-NLOPB issues licences for land tenure that afford the holder of the licence exclusive rights to explore for or produce petroleum resources.

3.4.1 Commercial Fisheries

The Government of Canada has jurisdiction over commercial fisheries for sedentary and non-sedentary species within its 200 nm EEZ, and for sedentary commercial fisheries to the extent of the defined continental shelf. The Project Area includes parts of NAFO Division 3LM. The available data (see Figure 3.3, which shows overall fishing activity by year) indicate that key species that have been fished in and around the Project Area in recent years include, but are not limited to: Northern shrimp, turbot / Greenland halibut, redfish, Atlantic halibut, Atlantic cod, snow crab, roughhead grenadier, and greysole / witch flounder. Fishing activity occurs year-round in the region, but is concentrated primarily in the May-July period. Beyond the EEZ, the NAFO has jurisdiction over the management of non-sedentary species, and the ability to designate protected areas (Amec 2014). The NAFO fisheries footprint is 120,048 km² in size, and its location and relationship to the current Project Area is illustrated in Figure 3.4.

3.4.2 Indigenous Commercial-Communal Fisheries

Several Indigenous groups in Newfoundland and Labrador hold commercial-communal fishing licences for NAFO Divisions offshore eastern Newfoundland. This includes licences permit access to a variety of species including groundfish and pelagic fish species, shrimp, tuna, swordfish, snow crab, and seal in various locations within Divisions 3KLMN0 (D Ball, DFO, pers comm) (Table 3.1).

Table 3.1 Commercial-Communal Fishing Licenses Issued to Newfoundland and Labrador Indigenous Groups off Eastern Newfoundland

Indigenous Group	Commercial Communal Fishing Licenses
Labrador Inuit (Nunatsiavut Government)	Inshore groundfish enterprises licensed to operate in 3KL, and seal licences in Seal Fishing Areas 4-33 (Atlantic-wide).
Labrador Innu (Innu Nation)	Mid-shore enterprise (65 to 100 feet) with a groundfish licence permitting access to a variety of areas (Atlantic-wide) including 3KLMN and an Area 6 (3K) shrimp licence; an inshore enterprise with a mobile gear and fixed gear groundfish licence for 3KL.
NunatuKavut Community Council	Multiple inshore enterprises with access to 3KL groundfish; Area 6 (3K) shrimp licences; seal licences allowing access in Seal Fishing Areas 4-33 (Atlantic-wide).

Indigenous Group	Commercial Communal Fishing Licenses
Miawpukek First Nation	Multiple enterprises and licences that give access to 3KL; tuna licences in 3LN; a seal licence for Seal Fishing Areas 4-33; a swordfish licence that includes 3KLMNO.
Qalipu Mi'kmaq First Nation Band	An inshore enterprise with a groundfish licence for 3K; a shrimp licence for Area 6 (3K); pelagic fishery access (herring, mackerel, and capelin) which occurs close to shore in 3KL; a snow crab licence for Area 4 (3K).

Several First Nations communities and councils in the DFO Maritimes and Gulf Regions hold commercial-communal licences for swordfish in NAFO Divisions 3, 4, and 5. However, DFO geospatial data (2010-2016) indicates no landings for swordfish in or around the Project Area over that period.

There are no documented food, social, or ceremonial (FSC) licences within or near the Project Area. The closest Reserve to the Project is Conne River, located on the south coast of Newfoundland approximately 635 kilometres west of the Project Area.

Section 4.2 provides a listing of various Indigenous groups in Newfoundland and Labrador, Nova Scotia, New Brunswick, Prince Edward Island and Québec, with a focus on those that are known to have interests related to offshore oil and gas activities off eastern Newfoundland and who have participated in recent and on-going EA reviews for such projects in the region under CEAA 2012.

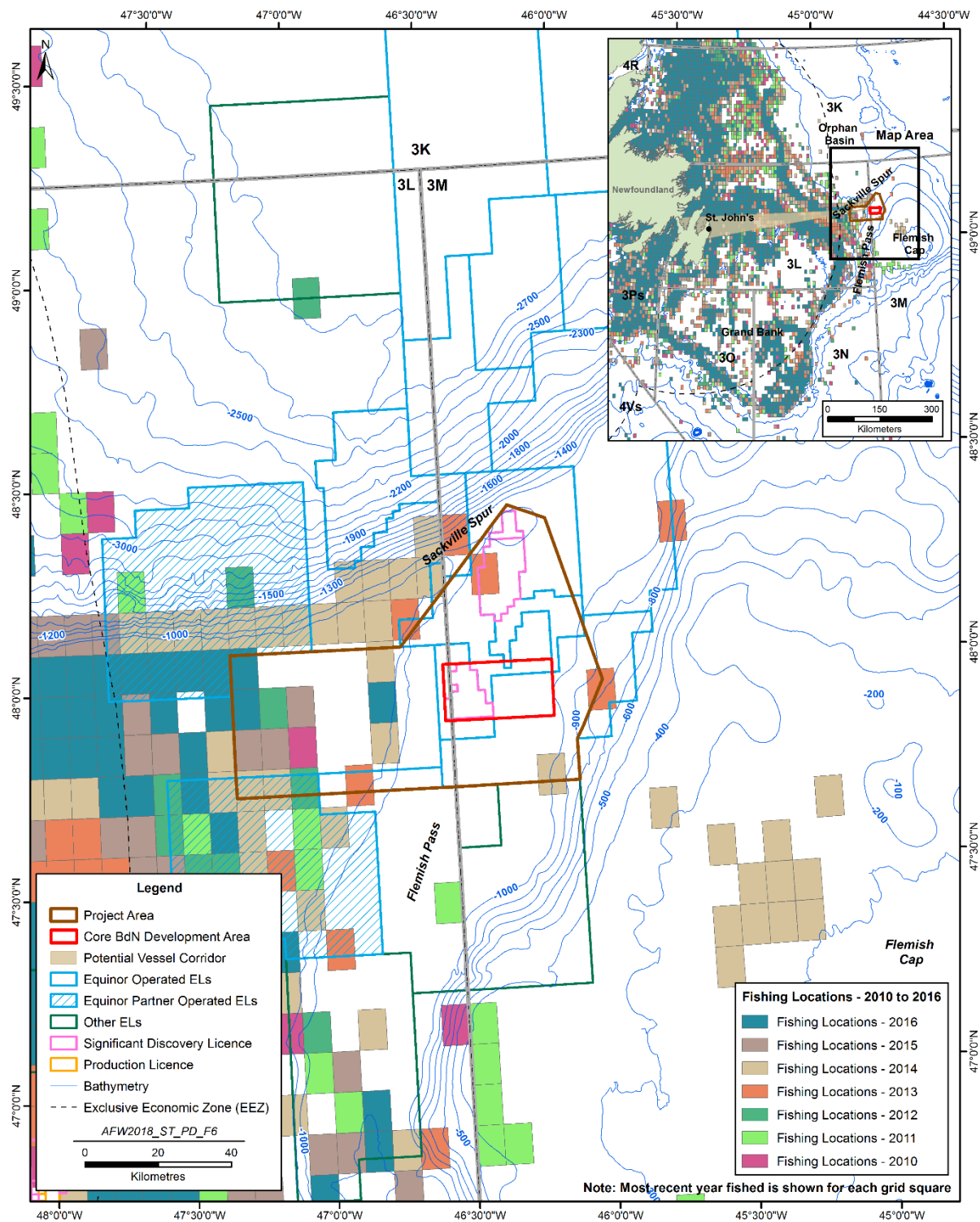


Figure 3.3 Commercial Fishing Locations, All Species (2010-2016)

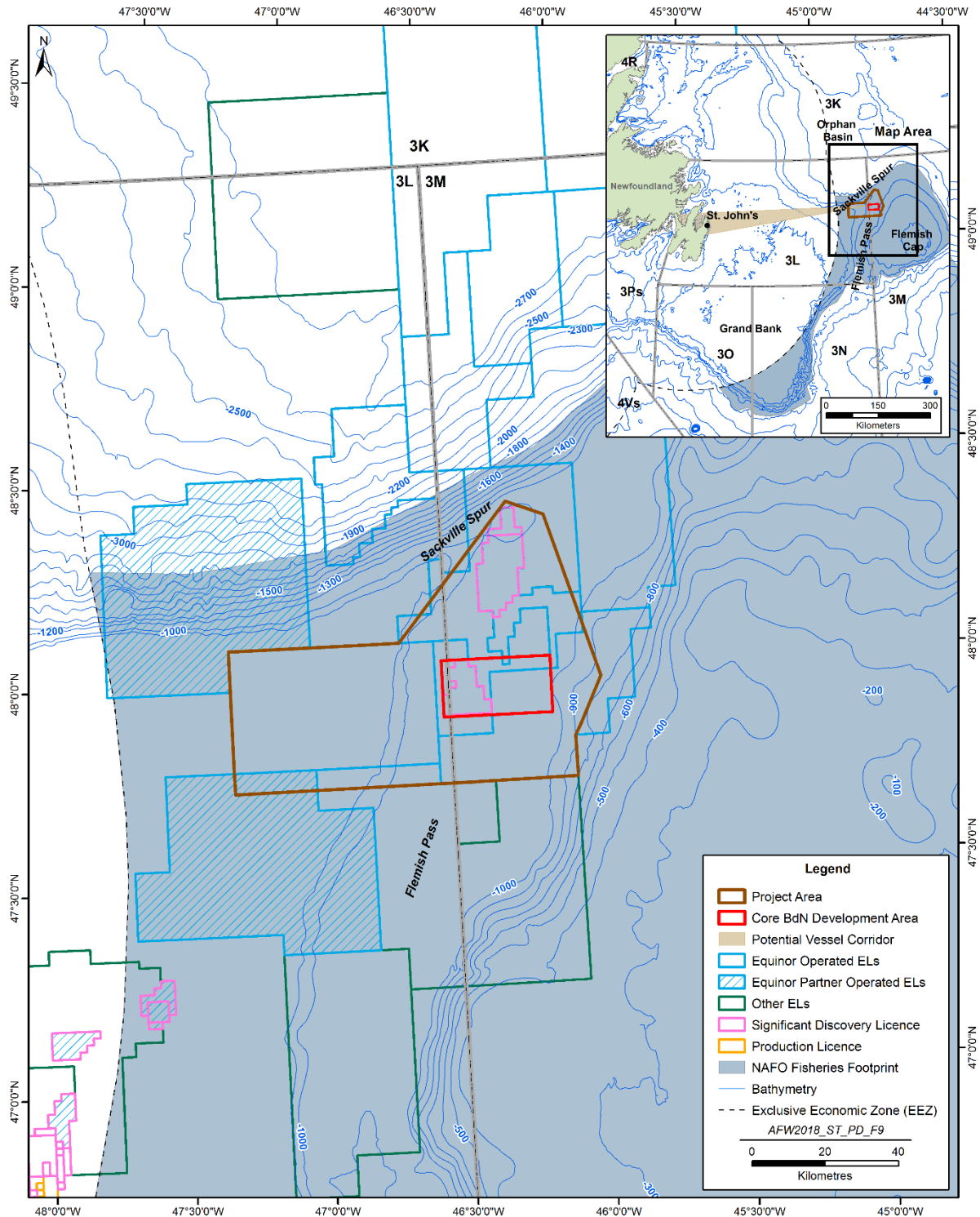


Figure 3.4 NAFO Fishing Zones and Foreign Fleet Fisheries "Footprint"

3.4.3 Other Ocean Uses

A number of fisheries survey programs are undertaken by government and/or industry in the Canada-NL offshore area. The DFO Multispecies Research Vessel Trawl Surveys include annual (spring and fall) standardized bottom-trawl surveys to collect information for managing and monitoring fish resources in the Newfoundland and Labrador Region. The annual Industry-DFO Collaborative Post-season Trap Survey for snow crab in NAFO Divisions 2J3KLOPs4R is conducted using commercial and modified snow crab traps at established trap stations starting in late August or early September after the commercial snow crab season has ended.

There are other marine-based human activities occurring in or adjacent to the Project Area either on a year-round or seasonal basis. General shipping traffic within and through the region includes marine tanker traffic and supply vessels associated with the existing offshore oil development and activities, as well as cargo ships, fishing vessel transits, and other marine vessel traffic. Naval training exercises also occur off Eastern Newfoundland and include both surface vessels and submarines. There are also known and potential unexploded ordnance sites in the Atlantic Ocean, which include shipwrecks and submarines as well as munitions dump sites off eastern Newfoundland (Amec 2014). Marine cable networks also cross through the region.

The Canada-NL Offshore Area is subject to ongoing oil and gas exploration and production activity, including geophysical surveys, drilling programs and oil and gas production activities (Figure 3.5). To date, several thousands of kilometres of seismic data have been collected. As of March 2018, 231 development wells, 57 delineation wells, and 171 exploration wells (C-NLOPB website) have been drilled offshore Newfoundland and Labrador. Offshore oil production activities have been ongoing since the 1990s with four active producing operations - Hibernia, Terra Nova, White Rose, and Hebron. These offshore oil and gas exploration and development activities include ongoing ancillary and supporting activities.

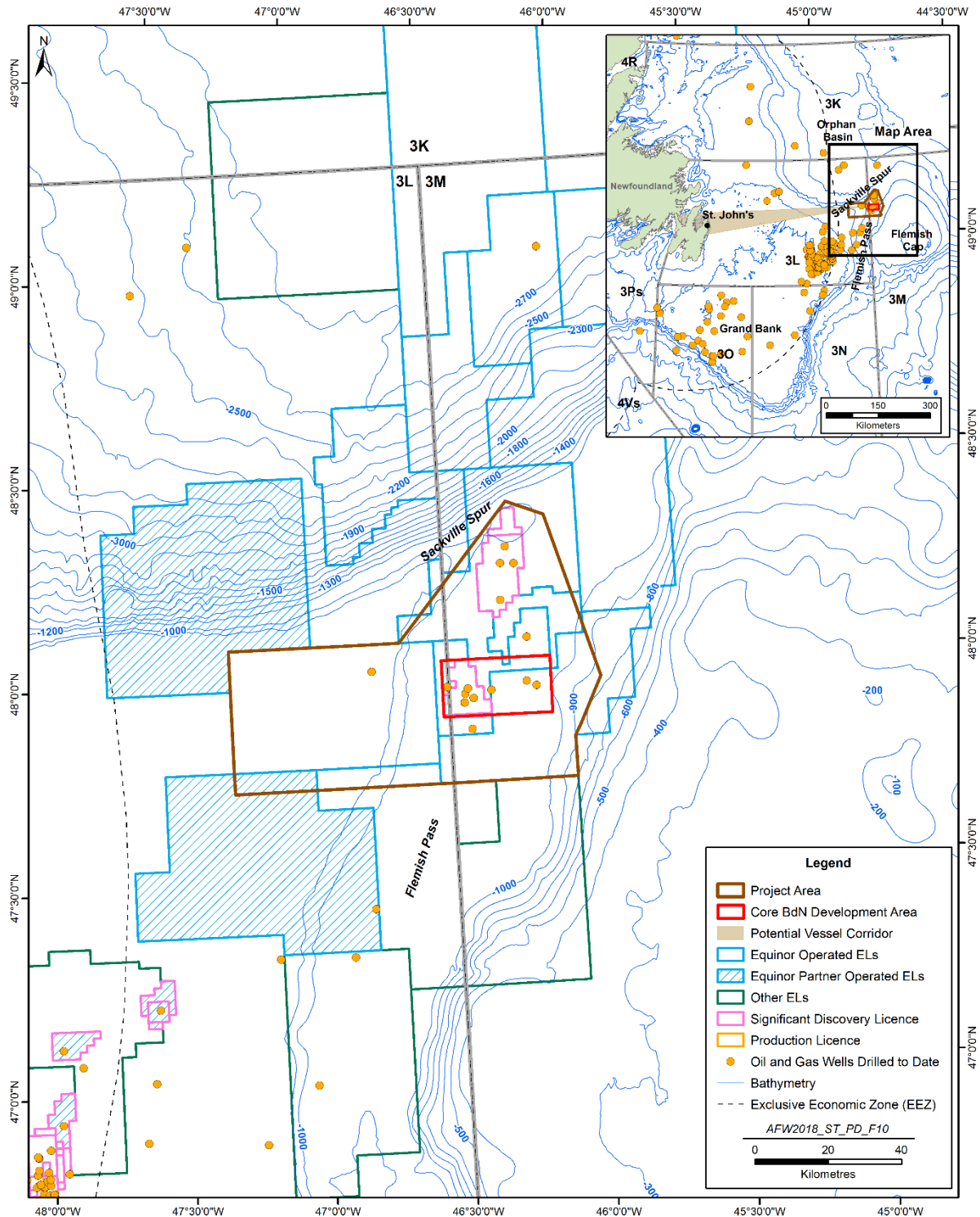


Figure 3.5 Previously Drilled Oil and Gas Wells (not inclusive of all wells drilled)

4 Engagement

Engagement is a key component of Equinor's approach to the planning and implementation of its activities. A number of associated initiatives have been undertaken, are in progress, or are being planned in relation to the Project, including discussions with relevant government departments and agencies, Indigenous groups, stakeholder organizations and interested members of the public.

Should an EIS be required for the Project, Equinor Canada will design and implement an engagement program that will provide various mechanisms and opportunities for regulatory agencies, Indigenous groups and key stakeholders to receive and review information and provide feedback on the Project regarding local and Indigenous knowledge related to the Project area and any concerns and issues that may require consideration in the EIS or be addressed through associated mitigation.

The following is an overview of ongoing and planned engagement activities for the Project.

4.1 Regulatory Engagement

As noted in Chapter 1, provincial and federal government departments and agencies may have regulatory responsibilities related to the Project and its potential environmental effects. As part of the planning and preparation of the EIS, Equinor Canada will meet with regulatory organizations to provide Project information and determine regulatory requirements for the Core BdN Development. The following is a list of federal and provincial agencies who may have an interest in the Project:

- Canadian Environmental Assessment Agency
- C-NLOPB
- DFO
- Environment and Climate Change Canada
- Transport Canada
- Department of National Defence
- Natural Resources Canada
- NL Department of Municipal Affairs and Environment
- NL Department of Fisheries and Land Resources
- NL Department of Natural Resources

The federal review of this Project Description will help to identify any important environmental questions and issues related to the Project for consideration by the Canadian Environmental Assessment Agency in determining whether (and if so, what level of) EA is required and the scope and focus of that review. If further assessment is deemed necessary, relevant departments and agencies will also be involved in the development and finalization of EIS Guidelines, the eventual review of the Project's EIS, and at other stages of the review process.

Equinor Canada will also continue to consult directly with relevant government departments and agencies as part of the planning and completion of any required EIS for the Project, as well as in

any post-EA environmental permitting and overall environmental management initiatives during its eventual implementation.

4.2 Indigenous Engagement

4.2.1 Background

Consistent with its corporate values (Courageous, Open, Collaborative and Caring) Equinor Canada is committed to ensuring that all Indigenous groups affected by its operations are appropriately informed and provided meaningful opportunities for engagement regarding the company's on-going and planned activities.

The Project will be located in the Flemish Pass, approximately 450 km from St. John's, in the same area as Equinor Canada's Flemish Pass Exploration Drilling Program ("Exploration Drilling Program") (Statoil 2017a) which is currently undergoing EA review under CEAA 2012. Due to the proximity and similar nature of the two planned activities, Equinor Canada anticipates engagement with the same groups as are currently engaged in relation to the Exploration Drilling Program and further anticipates that issues raised in the context of Exploration Drilling will be equally relevant to the environmental assessment of the Project.

As part of the Exploration Drilling Program environmental assessment, Equinor Canada has been engaged with 41 Indigenous groups as well as several representative Indigenous organizations in Newfoundland and Labrador, the Maritime provinces and Quebec during the past two years (Table 4.1). Figures 4.1 and 4.2 identify the locations of these Indigenous communities in relation to the Project Area. Distances of the various Indigenous groups from the Project Area range from approximately 635 km (Miawpukek First Nation, NL), 1,000 km (Membertou, NS), to more than 1500 km (Ekuanitshit, Nutashkuan, QC). Consultation will be tailored to ensure the opportunities for engagement are commensurate with the risk of potential impacts.

Table 4.1 Indigenous Groups Engaged by Equinor Canada to Date

Province	Indigenous Groups / Organizations
Newfoundland and Labrador	Labrador Inuit (Nunatsiavut Government)
	Labrador Innu (Innu Nation)
	NunatuKavut Community Council
	Miawpukek First Nation
	Qalipu Mi'kmaq First Nation Band
Nova Scotia	11 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



Province	Indigenous Groups / Organizations
	• Membertou First Nation
	• Paqtnekek 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
	Five Maliseet First Nation groups represented by Wolastoqey Nation of 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 groups represented by Mi'kmaq Confederacy of PEI
	• Abegweit First Nation
	• Lennox Island First Nation
Quebec	Three Mi'gmaq First Nation groups represented by Mi'gmawei Mawiomi Secretariat (MMS):
	• Micmas of Gesgapegiag
	• La Nation Micmac de Gespeg
	• Listuguj Mi'gmaq Government
	Les Innus d'Ekuanitshit
	Innu First Nation of Natashkuan

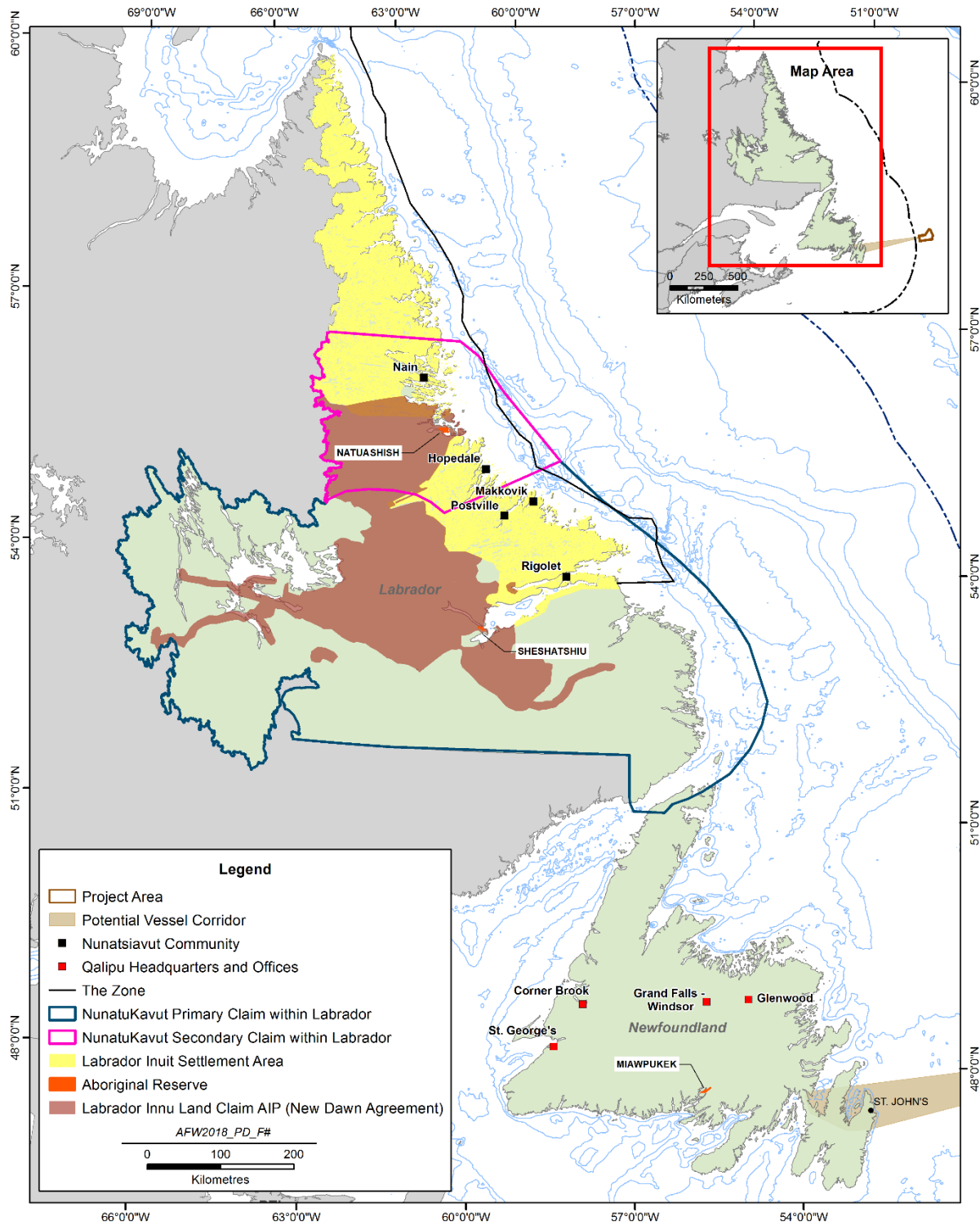


Figure 4.1 Indigenous Communities in Newfoundland and Labrador

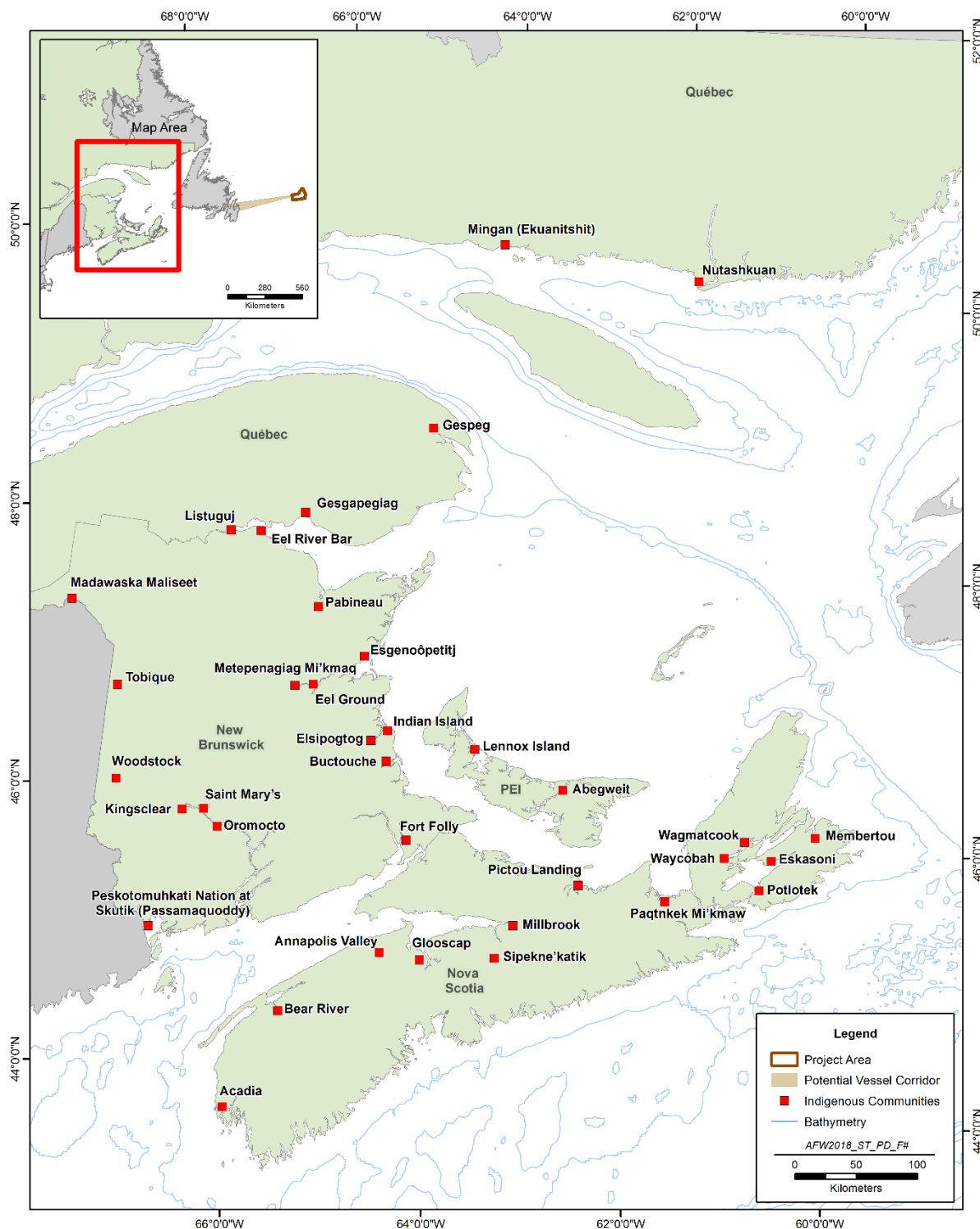


Figure 4.2 Indigenous Communities in the Maritime Provinces and Quebec

4.2.2 Approach to Engagement

A key objective of Equinor Canada's planned Project engagement is to promote communication and cooperation through ongoing dialogue with the named Indigenous groups as well as any others as directed by the Agency.

In order to achieve this objective, Equinor Canada will build upon its ongoing engagement efforts to proactively address issues previously raised in the context of the Exploration Drilling Program as well as any new issues that may be identified with respect to the proposed Project. As part of its planned engagement, Equinor Canada will provide ongoing Project-related information in a timely and culturally appropriate manner to each group or representative organization as appropriate in order to enhance its understanding of how these groups may potentially be affected by Project activities, to listen and respond to questions and concerns raised by the groups and to work with groups to identify and develop potential mitigation measures and monitoring programs for the Project. Equinor Canada will also make reasonable efforts to integrate Indigenous knowledge into the environmental assessment of the Project where relevant

4.2.3 EIS Preparation

Since it is likely that Equinor Canada will be required to engage with a wide range of Indigenous groups located throughout five provinces and characterized by distinct languages, histories and cultures, the approach to engagement, including the timing and nature of specific engagement activities, must be developed through discussion with the groups. However, while engagement will be tailored to the needs, interests and circumstances of the groups, including the requirements of any applicable consultation protocols, generally during the development of the EIS, Equinor Canada will:

- provide the groups with relevant Project-related information on a timely basis through written correspondence, power point presentations, reports and fact sheets, translated as necessary
- make reasonable efforts to meet with the various groups at mutually convenient times and locations (in person, by phone, by Skype or other mutually acceptable means)
- structure engagement processes to the extent possible to provide adequate time for Indigenous groups to review and comment on the relevant information.

Groups will be encouraged to provide Equinor Canada with their views on:

- the effects of potential changes to the environment on their health and socio-economic conditions, physical and cultural heritage and current use of lands and resources for traditional purposes pursuant to paragraph 5(1)(c) of CEAA 2012; and
- the potential adverse impacts of the project on potential or established section 35 rights.

In addition, during this period Equinor Canada will work with groups to collect Indigenous knowledge and will take into account in the Project EIS any relevant Indigenous knowledge to which it has access or that has been acquired through engagement.

Feedback obtained during this phase of engagement will be incorporated into the EIS as applicable and appropriate, and the EIS (if required under CEAA 2012) will document concerns and priorities raised and demonstrate how these have influenced Project planning and/or been considered in the EIS.

4.2.4 Post-EIS Submission

Equinor Canada is committed to establishing and maintaining relationships with Indigenous peoples that are based upon mutual respect and understanding and will continue to provide opportunities for information-sharing and exchange in the post-EIS submission period. Specific engagement activities will be determined through dialogue with Indigenous groups but in this period and until the EA Decision, Equinor Canada will continue to provide opportunities for engagement with the various groups that want ongoing communication from the Project. Equinor Canada will provide ongoing Project-related updates, to discuss any issues of concerns raised prior to the submission of the EIS or during the course of any information requests post-EIS submission and to provide information on proposed mitigation and monitoring measures.

Communication plans and strategies for subsequent phases (e.g. construction and operations) will be developed in conjunction with Indigenous groups.

4.2.5 Issues and Concerns

Equinor Canada has had the benefit of two years of engagement with the above named Indigenous groups in the context of the Exploration Drilling Program EIS (Statoil 2017a). Through this experience, Equinor Canada has acquired valuable information respecting each group's asserted or established aboriginal or treaty rights, the current use of lands and resources for traditional purposes and potential impacts of offshore operations upon Indigenous rights and interests.

Based on the results of its prior and ongoing engagement in the context of the Exploration Drilling Program, as well as Equinor Canada's review of and access to publicly available information, including information generated in the context of other offshore environmental assessments, it is Equinor Canada's understanding that none of these groups holds, claims or otherwise asserts Aboriginal or Treaty rights within or near the Project Area. Equinor Canada further understands that none of these groups currently use the lands or resources within the Project Area for traditional purposes. However, as described in Section 3.3.2, Equinor Canada is aware that fishing enterprises associated with several of these organizations do or may undertake commercial fishing activity within NAFO Divisions that overlap parts of the Project Area pursuant to the *Fisheries Act*, the associated *Aboriginal Communal Fishing Licences Regulations*, and other government policies and strategies that are designed to involve Indigenous people and communities in commercial fisheries in Canada.

As a result of its ongoing Indigenous engagement activities, Equinor Canada has also been made aware of the following concerns associated with offshore drilling activities:

- Fish and Fish Habitat: impacts on migrating marine fish and mammal species of traditional and cultural importance to Indigenous communities (i.e., Atlantic salmon, swordfish, Bluefin tuna and American eel) that may travel through or near the Project Area before reaching traditional territories (potential impacts upon fish and fish habitat, population distribution and food sources)
- Migratory Birds: potential increase in mortality events associated with flaring
- Waste discharges: impacts on fish and marine mammals
- Increased vessel activity: impacts on marine mammals and fishers (vessel strikes, loss or damage to fishing gear)
- Cumulative effects: proliferation (existing and planned) of offshore activities and impacts on fish, fish habitat, marine mammals, migratory birds
- Unplanned Project Activities: impacts of spills and blow-outs and resulting contamination (either direct or through the food chain) of species of cultural significance as well as destruction of habitat of corals, sponges, marine mammals and fish

These issues and concerns are captured in the potential project-related interactions, as described in Sections 5.1 and 5.2.

4.3 Stakeholder Engagement

As part of its on-going exploration activities Equinor Canada regularly engages with fisheries stakeholders and environmental groups that have historically been engaged in or have an interest in offshore oil and gas operations in Newfoundland and Labrador.

Fish harvesters and processors are a key stakeholder, and Equinor Canada has ongoing communication and engagement with them to keep them apprised of offshore oil and gas activity in their fishing areas and to address any concerns they may have. Fish harvesters engaged in fishing offshore Newfoundland are represented by the Fish Food and Allied Workers-Unifor (FFAW-Unifor). Fish processors include Ocean Choice International, Association of Seafood Producers, and Groundfish Enterprise Allocation Council. One Ocean is the liaison organization established by and for the fishing and petroleum industries of Newfoundland and Labrador. Its objective is to assist the fishing and petroleum industries in understanding each sector's operational activities. Members of the One Ocean Board and working group include representatives from FFAW-Unifor, fish processors, and offshore oil and gas operators.

Non-governmental environmental groups, which have been actively engaged regarding offshore oil and gas activities offshore NL, include Nature NL, World Wildlife Federation, Canadian Parks and Wilderness Society, Protected Areas Association of Newfoundland, and Sierra Club (NL Chapter).

Equinor Canada will build upon the results of its prior and continuing engagement with these key stakeholders as the EIS, if required, is prepared to provide information on the project and address concerns or issues that may be raised by these or other stakeholders.

5 Potential Project-Related Environmental Interactions

Project activities have the potential to interact with, and may result in, associated changes to the receiving environment. Pursuant to CEAA 2012, the Project description is required to describe the potential changes to fish and fish habitat, aquatic species and migratory birds that may be affected by carrying out the Project. Potential environmental effects may occur as a result of planned Project activities, as well as any unplanned events such as an accident or malfunction.

5.1.1 Planned Project Components and Activities

Potential planned activities that may result in changes to the environment are described in detail in Chapter 2. The following is summary list of those activities:

- Drilling
- Construction, Installation and Hook-up and Commissioning
- Production and Maintenance
- Ancillary and supporting activities (supply / servicing, surveys)
- Decommissioning

An overview of the potential environmental interactions and/or changes to the environment resulting from planned Project Activities, as specified under CEAA 2012 are outlined in Table 5.1. Should an EIS be required, these potential interactions and associated effects assessment will be addressed in the EIS.

Table 5.1 Environmental Components / Issues and Potential Environmental Interactions Relevant to CEAA 2012 – Planned Project Components and Activities

Environmental Component / Issue	Relevant Section(s) of CEAA 2012	Potential Environmental Interactions / Changes
Fish, Fish Habitat, and Aquatic Species	5(1)(a)(i) 5(1)(a)(ii)	• Potential changes to water quality and degradation and disturbance to marine benthic habitats due to physical disturbance of the substrate (e.g., installation and presence of subsea infrastructure, discharge of drill cuttings), and discharge of liquid wastes. • Sound and light disturbances associated with presence and operation of the production and drilling installations, vessels, and geophysical surveys, resulting in possible avoidance or attraction by marine biota (fish, mammals, turtles). • Associated direct (injury or mortality) or indirect (alterations of key life history activities and requirements, such as migration, reproduction, communication, availability and quality of food sources) effects on marine biota
Migratory Birds	5(1)(a)(iii)	• Attraction and disturbance / disorientation or stranding, potential injury or mortality

Environmental Component / Issue	Relevant Section(s) of CEEA 2012	Potential Environmental Interactions / Changes
		- Possible health effects due to contamination of individuals and/or their habitats - Potential effects on prey species / food sources
Project Activities Occurring on Federal Lands	5(1)(b)(i)	- The proposed Project Area includes marine areas (lands) that are located beyond Canada's EEZ on the outer continental shelf, whereas some other Project related activities (such as associated supply vessel traffic) will take place within the Canada's EEZ. - Where planned Project components and activities occur on or near such federal lands, any resulting environmental effect described in this Project Description may affect existing environmental conditions on these lands.
Transboundary Issues	5(1)(b)(ii)	- Planned project activities are not anticipated to result in changes to the environment outside Newfoundland and Labrador, or outside the marine waters under the jurisdiction of Canada. - Although the direct environmental zone of influence of any Project components and activities occurring within the Canada's jurisdiction are not expected to extend to other jurisdictions, the Project may affect environmental components (such as migratory fish, aquatic species, or birds and air and water quality) that extend to and/or move both within and outside the areas under the jurisdiction of Canada.
Health and Socio-Economic Conditions for Indigenous Peoples	5(1)(c)(i)	- Potential socioeconomic changes to Indigenous fisheries (landings and values) and other marine activities due to biophysical changes (resource availability, distributions, quality), access / interference, damage to equipment or other direct or indirect interactions. - Potential interactions with protected or special marine areas and possible associated effects on their human use and value. - Planned Project activities are not expected to result in any changes to the environment that would have an effect on the health of Indigenous Peoples
Health and Socio-Economic Conditions	5(2)(b)(i)	- Potential socioeconomic changes to fisheries (landings and values) and other marine activities due to biophysical changes (resource availability, distributions, quality), access / interference, damage to equipment or other direct or indirect interactions. - Potential interactions with protected or special marine areas and possible associated effects on their human use and value.

Environmental Component / Issue	Relevant Section(s) of CEEA 2012	Potential Environmental Interactions / Changes
		Planned Project activities are not expected to result in any changes to the environment that would have an effect health conditions
Physical and Cultural Heritage, or Resources of Historical, Archaeological, Paleontological, or Architectural Significance	5(1)(c)(ii) 5(1)(c)(iv) 5(2)(b)(ii) 5(2)(b)(iii)	There are no interactions or anticipated changes to these resources as a result of planned Project activities in the Project Area, which is located several hundred kilometers offshore.
Current Use of Lands and Resources for Traditional Purposes by Aboriginal Groups	5(1)(c)(iii)	Planned project activities are not anticipated to result in any changes to the environment that would have an effect on the current use of land and resources for traditional purposes by Indigenous peoples other than commercial-communal fisheries and associated socioeconomic interactions (discussed above) given the Project Area's water depth and distance from the nearest Indigenous community. There are no documented food, social, or ceremonial licences within or near the Project Area.
Other Changes to the Environment Directly Related or Necessarily Incidental to a Federal Authority's Exercise of a Power or Performance of a Duty or Function in Support of the Project	5(2)(a)	Planned Project activities authorized by the C-NLOPB have the potential to result in changes to the atmospheric environment due to the release of air emissions and generation of noise associated with drilling and production operations.

Relevant environmental planning, management and mitigation measures will be considered in the environmental effects analyses provided as part of the EIS, if required, for the Project.

5.1.2 Potential Unplanned Events

While unlikely, non-routine activities, or unplanned events that could occur during offshore petroleum development activities include well control events (subsea blowouts), batch spill, (e.g., crude, hydraulic fluid, drilling mud, diesel), vessel collisions, and dropped objects. Spill trajectory modelling will be carried out to predict areas that could be potentially affected by a blowout and batch spills. Potential environmental interactions or changes may occur within the defined spill area or as a result of migratory species travelling through the affected area.

Equinor's objective in its operations is to ensure safe and efficient operations; spill prevention is the primary focus in all operations. An overview of Equinor Canada's emergency response plans, including spill prevention, preparedness and response measures, will be provided in the EIS, if required.

Table 5.2 provides an overview of the potential environmental interactions that may be associated with unplanned Project components and activities to the environmental components and issues that are specified under CEAA 2012.

Table 5.2 Environmental Components / Issues and Potential Environmental Interactions Relevant to CEAA 2012 – Unplanned Project Components and Activities

Environmental Component / Issue	Relevant Section(s) of CEAA 2012	Potential Environmental Interactions / Changes
Fish, Fish Habitat, and Aquatic Species	5(1)(a)(i) 5(1)(a)(ii)	Potential changes in the presence, abundance, distribution and/or health of marine fish / other aquatic species as a result of exposure to accidental spills (including injury or mortality through physical exposure, ingestion, or effects on prey and habitats / water quality).
Migratory Birds	5(1)(a)(iii)	Changes in the presence, abundance, distribution and/or health of marine birds as a result of exposure to accidental spills (including injury or mortality through physical exposure, ingestion, or effects on prey and important habitats).
Project Activities Occurring on Federal Lands	5(1)(b)(i)	- The proposed Project Area includes marine areas (lands) that are located beyond Canada's EEZ on the outer continental shelf, whereas some other Project related activities (such as associated supply vessel traffic) will take place within Canada's EEZ. - Where Project components and activities and any associated unplanned events (such as an oil spill) occur on or near such federal lands, any associated environmental effects as described in this Project Description may affect existing environmental conditions on these lands.
Transboundary Issues	5(1)(b)(ii)	- An accidental event has the potential to result in transboundary effects (e.g., fish and fish habitat, aquatic species, migratory birds, air quality, water quality) outside the marine waters under the jurisdiction of Canada; no land masses are anticipated to be affected. - Spill trajectory modelling and analyses will assess the nature and geographic extent of any such accidental event and its potential effects.
Health and Socio-Economic Conditions for Indigenous Peoples	5(1)(c)(i)	- Potential effects of offshore spills on commercial-communal fishing activities including closure of commercial-communal fishing areas, reduced catchability, gear damage and reduced market value - Potential taint, quality and/or contamination of fish species

Environmental Component / Issue	Relevant Section(s) of CEEA 2012	Potential Environmental Interactions / Changes
		Potential interactions with protected or special marine areas and associated effects on their human use and value.
Health and Socio-Economic Conditions	5(2)(b)(i)	- Potential effects of offshore spills on commercial fishing activities including closure of commercial fishing areas, reduced catchability, gear damage and reduced market value - Potential taint, quality and/or contamination of fish species - Potential interactions with protected or special marine areas and associated effects on their human use and value.
Physical and Cultural Heritage, or Resources of Historical, Archaeological, Paleontological, or Architectural Significance	5(1)(c)(ii) 5(1)(c)(iv) 5(2)(b)(ii) 5(2)(b)(iii)	- No interactions or adverse effects are anticipated as a result of unplanned Project activities in this marine environment, which is located several hundred kilometers offshore. - Oil spill modelling and analyses will assess the nature and geographic extent of any such accidental event and its potential effects.
Current Use of Lands and Resources for Traditional Purposes by Aboriginal Groups	5(1)(c)(iii)	Accidental events may result in changes to the environment that may affect traditional and or cultural use of migratory species, including: - Contamination-related restrictions on traditional fish harvesting activities - Change in the distribution, population size, behavior and/or health of fish and or migratory birds - These changes could potentially occur within the predicted spill trajectory area or as a result of migratory species transiting through the affected area. Oil spill modelling and analyses will assess the nature and geographic extent of any such accidental event and its potential effects
Other Changes to the Environment Directly Related or Necessarily Incidental to a Federal Authority's Exercise of a Power or Performance of a Duty or Function in Support of the Project	5(2)(a)	Accidental events occurring as a result of activities authorized by the C-NLOPB have the potential to result in temporary and localized changes to the marine environment and air quality.

5.2 Environmental Assessment Scoping Considerations

Based on the initial information and analysis provided above, and in keeping with most recent EAs for similar projects of Newfoundland and Labrador and elsewhere, a preliminary list of potential Valued Components upon which any eventual EIS will be focused is provided below:

- a) Atmospheric Environment
- b) Marine Fish and Fish Habitat (including Species at Risk)
- c) Marine and Migratory Birds (including Species at Risk)
- d) Marine Mammals and Sea Turtles (including Species at Risk)
- e) Special Areas
- f) Indigenous Communities and Activities
- g) Fisheries and Other Ocean Uses.

Onshore activities, such as supply and servicing and construction and fabrication, will occur at existing facilities and which are subject to independent permitting and regulatory requirements.

Equinor Canada recognizes that the scope and focus of any EIS that may be required under CEAA 2012, including the final selection of Valued Components upon which it will focus, will be informed by and based upon the results of the review processes described previously, including associated input from participating governmental, Indigenous, stakeholder and public interests, and again will be set by the Canadian Environmental Assessment Agency.

6 References

- Amec Environment & Infrastructure. 2014. Eastern Newfoundland and Labrador Offshore Area Strategic Environmental Assessment. Submitted to Canada-Newfoundland and Labrador Offshore Petroleum Board, St. John's, NL.
- Baillon, S., Hamel, J.-F., and A. Mercier. 2014a. Diversity, distribution and nature of faunal associations with deep-sea pennatulacean corals in the Northwest Atlantic. *PloS one*, 9(11): e111519.
- Baillon, S., Hamel, J.-F., Wareham, V.E., and A. Mercier. 2014b. Seasonality in reproduction of the deep-water pennatulacean coral *Anthoptilum grandiflorum*. *Marine Biology*, 161(1): 29-43.
- Ball, D., Fisheries and Oceans, Personal communication. 2017.
- Beazley, L.I. and E.L. Kenchington. 2015. Epibenthic Megafauna of the Flemish Pass and Sackville Spur (Northwest Atlantic) Identified from In Situ Benthic Image Transects. Canadian Technical Report of Fisheries and Aquatic Sciences, 3127: v + 496 pp.
- Beazley, L.I., Kenchington, E.L., Murillo, F.J., and M. del Mar Sacau. 2013. Deep-sea sponge grounds enhance diversity and abundance of epibenthic megafauna in the Northwest Atlantic. *ICES Journal of Marine Science*, 70(7): 1471-1490.
- C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2009. Development Plan Guidelines.
- C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2017. Geophysical, Geological, Environmental and Geotechnical Program Guidelines. vii + 57 pp.
- DFO (Fisheries and Oceans Canada). 2007. Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment. Available at: <http://www.dfo-mpo.gc.ca/oceans/publications/seismic-sismique/index-eng.html>
- ECCC (Environment and Climate Change Canada). 2017. National Inventory Report, 1990-2015: Greenhouse Gas Sources and Sinks in Canada.
- Guijarro, J., Beazley, L., Lirette, C., Kenchington, E., Wareham, V., Wilkinson, K., Koen-Alonso, M., and F.J. Murillo. 2016. Species distribution modelling of corals and sponges from research vessel survey data in the Newfoundland and Labrador region for use in the identification of significant benthic areas. Canadian Technical Report for Fisheries and Aquatic Sciences, 3171: vi + 126 pp.
- Knudby, A., Kenchington, E. and F.J. Murillo. 2013. Modeling the distribution of *Geodia* sponges and sponge grounds in the Northwest Atlantic. *PloS one*, 8(12): e82306.
- Murillo, F. J., Muñoz, P. D., Altuna, A. and A. Serrano. 2011. Distribution of deep-water corals of the Flemish Cap, Flemish Pass, and the Grand Banks of Newfoundland (Northwest Atlantic Ocean): interaction with fishing activities. *ICES Journal of Marine Science*, 68(2): 319-332.



- Murillo, F. J., Muñoz, P. D., Cristobo, J., Ríos, P., González, C., Kenchington, E., and Serrano, A. 2012. Deep-sea sponge grounds of the Flemish Cap, Flemish Pass and the Grand Banks of Newfoundland (Northwest Atlantic Ocean): distribution and species composition. *Marine Biology Research*, 8(9): 842-854.
- Murillo, F.J., Kenchington, E., Lawson, J.M., Li, G., Piper, D.J.W. 2016a. Ancient deep-sea sponge grounds on the Flemish Cap and grand Bank, northwest Atlantic. *Marine Biology* 163:63.
- Murillo, F.J., Serrano, A., Kenchington, E., and J. Mora. 2016b. Epibenthic assemblages of the Tail of the Grand Bank and Flemish Cap (Northwest Atlantic) in relation to environmental parameters and trawling intensity. *Deep-Sea Research Part I: Oceanographic Research Papers*, 109: 99-122.
- NEB (National Energy Board), C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board) and Canada-Nova Scotia Offshore Petroleum Board. 2009. Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands. iii + 13 pp.. Available online at: <http://www.cnlopb.ca/pdfs/guidelines/ocsg.pdf?lbisphpreq=1>
- Nogueira, A., González-Troncoso, D., and N. Tolimieri. 2016. Changes and trends in the overexploited fish assemblages of two fishing grounds of the Northwest Atlantic. *ICES Journal of Marine Science*, 73(2), 345-358.
- Statoil (Statoil Canada Ltd). 2017. Flemish Pass Exploration Drilling Program – Environmental Impact Statement. Prepared by Amec Foster Wheeler and Stantec Consulting. St. John's, NL, Canada. November 2017.
- Vázquez, A., Casas, J.M., Brodie, W.B., Murillo, F.J., Mandado, M., Gago, A., Alpoim, R., Bañón, R., and A. Armesto. 2013. List of Species as recorded by Canadian and EU Bottom Trawl Surveys in Flemish Cap. NAFO Scientific Council Research Document, 13/005: 1-13.
- Wareham, V.E. 2009. Updates on deep-sea coral distributions in the Newfoundland and Labrador and Arctic Regions, Northwest Atlantic: The ecology of deep-sea corals of Newfoundland and Labrador waters: biogeography, life history, biogeochemistry, and relation to fishes. Canadian Technical Report on Fisheries and Aquatic Sciences, 2830: 4-22.